

**MODELING PROTOCOL FOR
SO₂ NAAQS COMPLIANCE ANALYSES
FOR WARREN GENERATING STATION**

OPERATED BY: THE PENNSYLVANIA ELECTRIC COMPANY

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EXECUTIVE SUMMARY

This document describes procedures that TRC Environmental Corporation (TRC) proposes to follow while conducting a National Ambient Air Quality Standard (NAAQS) compliance modeling analysis for sulfur dioxide (SO_2) for the Pennsylvania Electric Company's Warren Generating Station. This protocol is based mainly on the results of the model comparison study for the Station, "Final Report on the Model Performance Comparison Study for Warren Generating Station" (TRC, 1994).

The models to be used in the compliance analyses include the Large Area Power Plant Effluent Study (LAPPES) model, the Rough Terrain Diffusion Model (RTDM), and the Multiple Point with Terrain (MPTER) model. The model comparison study showed that the LAPPES model is the superior model for determining air quality impacts from Warren Station in terrain above stack top, the "controlling" impacts for determining the compliance emission rate.

The database to be used in the compliance modeling incorporates minor revisions to the model comparison study database. The modifications were made to minimize the interference of SO_2 impacts stemming from a nearby major source of SO_2 . Deletions of monitored SO_2 data were made on the basis of a joint TRC/Pennsylvania Department of Environmental Resources (PaDER) analysis (Schmidt, K., 1994) and a follow-up PaDER study (Higgins, 1994). The results of these studies are summarized in the body of this protocol and the complete text of the PaDER study is appended.

A bootstrap analysis performed to determine whether any bias adjustment factors will have to be applied to the LAPPES-predicted impacts has shown that the model has no significant underprediction bias and does not require the application of any adjustment factors.

United Refining's SO_2 sources will be modeled with those of Warren Station to obtain the combined impact of SO_2 at critical receptors. Warren's compliance emission rates for full station operation and one unit alone, to be determined, will assure compliance with the NAAQS for SO_2 .

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**WARREN GENERATING STATION MODEL COMPARISON
STUDY (HIGGINS, 1994)**

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1.0 INTRODUCTION

The Pennsylvania Electric Company (Penelec) operates the Warren Generating Station which is located in a region of complex terrain in northwest Pennsylvania. The region is presently designated non-attainment for sulfur dioxide (SO_2) air quality, being originally designated as such on December 5, 1977. With regard to Warren Station, air quality impacts at high terrain locations are the primary concern.

Because of the area's non-attainment status, a dispersion modeling analysis is required to determine emission limits for Warren Station that will ensure National Ambient Air Quality Standards (NAAQS) attainment for the region. As a result of this modeling requirement, Penelec and the Pennsylvania Department of Environmental Resources (PaDER) entered into a Consent Order and Agreement (COA). The COA provides for a model evaluation study, interim emission limits, and a compliance schedule.

Penelec has used a systematic approach to develop a cost-effective dispersion modeling methodology to satisfy the COA for Warren Station. In the absence of an approved alternative, EPA guidance would require the use of two models to determine air quality impacts in the region: MPTER (EPA, 1980) for simple and intermediate terrain, and RTDM (ERT, 1987) for intermediate and complex terrain. As an alternative, Penelec proposed the LAPPES model which was developed from a field program conducted from 1967 to 1972 in the Laurel/Chestnut Ridge region of Pennsylvania. Previous studies at other locations have shown that RTDM overpredicted at elevated terrain locations by more than a factor of two. In contrast, LAPPES has not shown such prediction bias in elevated terrain and is the preferred model from Penelec's standpoint.

A model performance comparison study was carried out to gain regulatory approval to use LAPPES instead of RTDM to set emission limits for Warren Station. EPA's "Interim Procedures" document (EPA, 1984) was followed to develop a study protocol and culminated in a model comparison report which showed the LAPPES model to be superior to RTDM/MPTER for determining air quality impacts at elevated locations in the vicinity of Warren Station (TRC, 1994). PaDER acceptance of the model comparison study report was received on August 25, 1994 (Slade, 1994). The results of the model comparison study are summarized as follows:

- LAPPES is the model which best simulates the air quality impacts at elevated terrain in the vicinity of Warren Station.
- LAPPES outperformed RTDM/MPTER and met the scoring criteria specified in the modeling protocol to be selected as the winning model.
- RTDM/MPTER did not estimate air quality impacts accurately in elevated terrain for the physical circumstances modeled in this study, and scored poorly in comparison to LAPPES.
- A large percentage of the peak SO₂ concentrations measured by the Warren Station monitoring network were primarily attributable to other sources and not Warren Station.

The last point presented a complication. It was determined that the impacts stemming from a nearby oil refinery, United Refining, significantly affected the monitored SO₂ database. In order to use the database to objectively assess model performance for Warren Station, United Refining's contributions had to be either eliminated, accounted for, or otherwise minimized using objective procedures. Such procedures were developed by TRC and approved by PaDER for the model performance evaluation study. A later independent study conducted by PaDER (Higgins, 1994) produced similar conclusions regarding the frequency and magnitude of United Refining's impacts. PaDER's study is included as an Appendix to this compliance modeling protocol.

The next step in the process is to use RTDM, LAPPES, and MPTER in accordance with an approved compliance modeling protocol to determine new SO₂ emission limits for Warren Station. The objective of the protocol is to define the details of the procedures and methods proposed for the application and execution of the models. Included in this protocol are the results of a bootstrap analysis which was performed to determine if any adjustment factors would be required for the LAPPES model. This protocol will be submitted to PaDER for review and approval. The resulting consensus among Penelec and the regulatory agencies will ensure that the agreed upon procedures will result in technically sound applications of the models.

Section 2 of this protocol is an overview of the modeling plan. Section 3 comprises the bulk of this document and describes the specific procedures to be followed by each model as it is applied to the emission source (Warren Station and United Refining) for which it was

approved. Model options, terrain, receptors, sources, meteorological data, background concentrations, and bias adjustment factors will be discussed and defined. References are provided in Section 4.

2.0 OVERVIEW OF THE MODELING PLAN

The locations of Warren Station and the regional terrain are shown in Figure 2-1. The terrain in the region surrounding Warren Station ranges in elevation from 1150 feet above mean sea level (msl) in the river valley to 1960 feet on the terrain north and south of the plant. The region for which Penelec will use LAPPES in place of RTDM/MPTER is the elevated terrain (above stack top) in the immediate vicinity of Warren Station. This region (hereinafter called the "study region") is illustrated in Figure 2-1 by the heavy line. Also shown in the figure is the location of the only other significant SO₂ source, United Refining (cross-hatched area just east of the study region). The effects of United Refining's sources on the SO₂ monitored database alluded to above "influenced" the database to the extent that special studies had to be conducted to purge the affected data. These studies will be addressed later in this protocol.

Penelec is proposing to use the following dispersion models to assess SO₂ impacts from Warren Station. United Refining's sources will also be modeled.

SO ₂ Source	Dispersion Model		
	Complex Terrain		Simple Terrain
	Above Plume Height	Intermediate	
Warren Station	I.APPES	LAPPES	MPTER
United Refining	RTDM	RTDM/MPTER	MPTER

For Warren Station, the LAPPES model will be used to predict concentrations in complex terrain (i.e., above stack top) only at receptors located within the study region (Figure 2-1). The MPTER model will be used to predict concentrations in simple terrain (i.e., below stack top). The LAPPES model will also be used to predict concentrations in intermediate terrain (i.e., at receptors with elevations between stack top and plume height) inside the study region. For United Refining at all receptors, the RTDM, RTDM/MPTER and MPTER models will be used to predict concentrations in above-plume-height, intermediate and simple terrain, respectively.

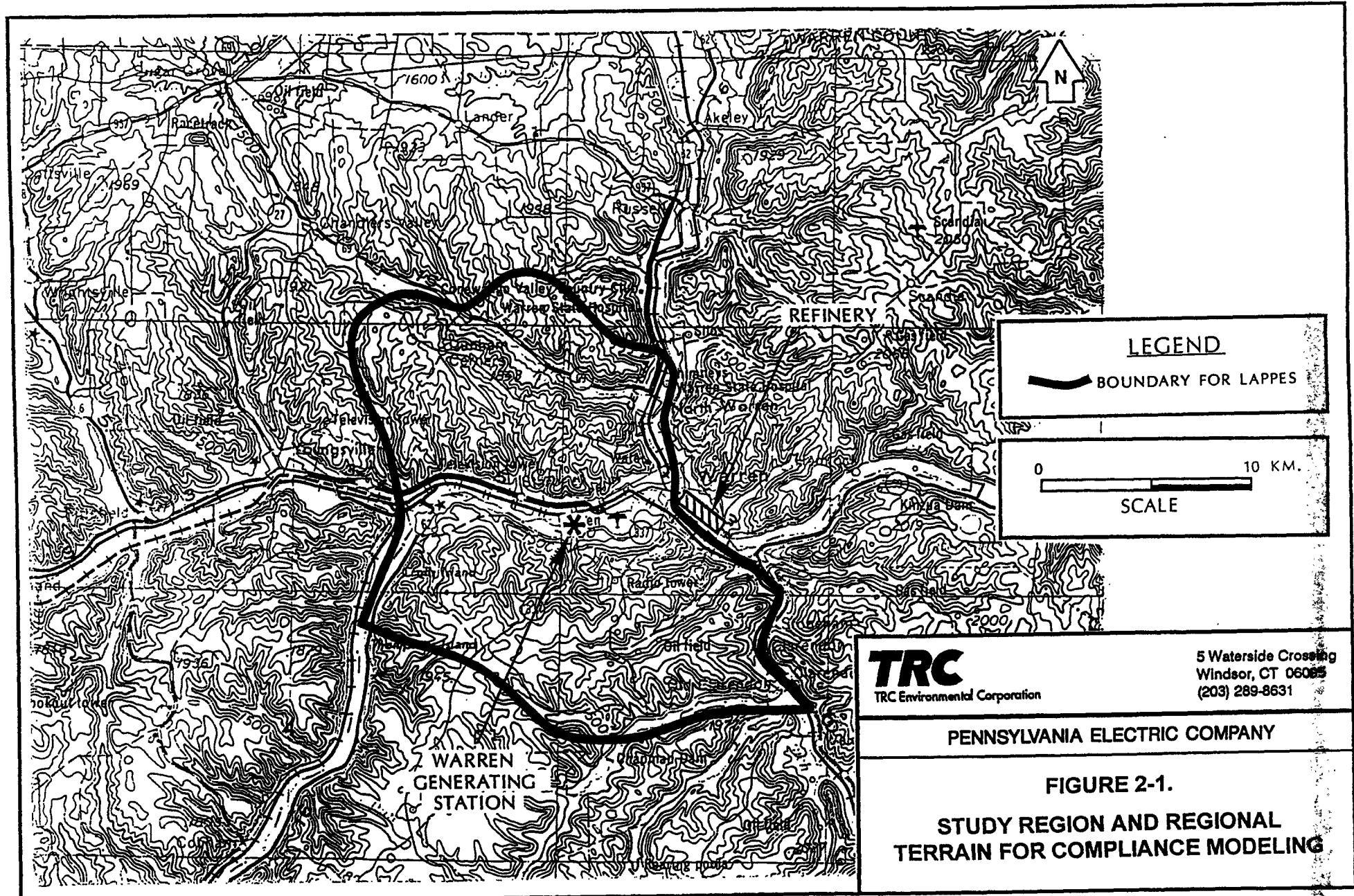


FIGURE 2-1.

STUDY REGION AND REGIONAL TERRAIN FOR COMPLIANCE MODELING

The proposed compliance modeling receptor grid consists of 417 points. Most of these receptors are concentrated on the high terrain within 5 km north and south of Warren Station since preliminary modeling had indicated that both LAPPES and RTDM would predict peak impacts at those locations.

The meteorological input data will be the same as that used for the model comparison study, i.e., measurements from the two on-site meteorological towers at Conewango and Preston developed from the one-year period from March 1, 1993 through February 28, 1994.

The concentration predictions from the models will be adjusted for background concentrations and compared to the NAAQS for SO₂:

NAAQS		Background Concentrations
Averaging Time	Concentrations ($\mu\text{g}/\text{m}^3$)	
3-hour	1300*	See Section 3.4
24-hour	365*	
Annual	80	

* High second high values

The modeling procedures proposed herein are discussed in detail in the next section. They are summarized here as follows:

- Utilize the prepared meteorological database developed from one year of observations; March 1, 1993 to February 28, 1994;
- Utilize the receptor grid used in previous modeling exercises;
- Prepare input files for the RTDM, MPTER, and LAPPES dispersion models;
- Utilize post-processor programs to process concentrations from the MPTER, RTDM, and LAPPES models, hour-by-hour; and with LAPPES alone (i.e., in elevated terrain) to obtain 3-hour, 24-hour, and annual average impacts; and
- Compare predicted impacts to the NAAQS for SO₂.

3.0 PROPOSED MODELING PROCEDURES

The proposed models to be used in this analysis are RTDM, MPTER, and LAPPES. These models were described in the protocol for the model performance evaluation study (TRC, 1992), and the model descriptions therein are incorporated into this document by reference.

Penelec elected not to compare LAPPES versus MPTER in simple terrain for either Warren Station or United Refining. Therefore, MPTER will be used for all model predictions in simple terrain everywhere for both sources. Since LAPPES was the winning model in complex terrain in the study region for Warren Station, LAPPES will be used for all model predictions above stack top for Warren Station in the study region. RTDM/MPTER will be used for United Refining in intermediate terrain.

Except for the relatively minor modification of the monitored SO₂ database discussed in Section 3.4, the meteorological data, monitored SO₂ data, and proposed modeling procedures will be the same as those used in the model performance evaluation study. The exceptions for the compliance analyses are that specific identified hours will be deleted from the SO₂ database as a result of PaDER's study of United Refining's impacts. These deletions affect the background concentration values since the monitored SO₂ data for those hours were also eliminated. The background concentration estimation methodology is discussed and summarized in Section 3.4.

In the SO₂ monitoring network design analysis (TRC, 1991), it was found that 100 percent load conditions for Warren Station produced the maximum impacts. Other load conditions emitted less SO₂, but at lower exit velocities. The resulting lower plumes, which would tend to increase impacts, instead produced lower modeled impacts because the tendency to increase impacts due to lower plume rise was more than offset by the lower SO₂ emission rates associated with the lower load conditions. The compliance modeling analyses for Warren Station will therefore be limited to 100 percent load operating scenarios. Specifically, operation of both Units 1 and 2 combined and Unit 1 or 2 alone will be modeled to determine appropriate emission limits.

Emissions from the only other major SO₂ source in the area, United Refining, will also be modeled, and the resulting impacts will be added to those of Warren Station.

3.1 Source Data

Allowable SO₂ emissions and stack parameters corresponding to 100 percent load conditions for Warren Station are given in Table 3-1. There are 13 point sources of SO₂ located at United Refining. These will be modeled and their impacts added to the modeled impacts from Warren Station. The source parameter data for United Refining appear in Table 3-2. The data in Table 3-2 were also used in the model performance evaluation.

The stack parameters and emission rates shown in Tables 3-1 and 3-2 constitute the "base case" conditions for the compliance modeling. The compliance emission rates for Warren Station will be determined by comparing modeled impacts to the NAAQS for SO₂ and, after accounting for background concentrations, making adjustments to the base case emission rate to satisfy the NAAQS for SO₂.

3.2 Receptor Grid

The study region extends approximately 10 km north and south of Warren Station, 5 km to the east and 10 km to the west. A total of 417 receptors will be used and concentrated on terrain within 5 km north and south of the plant. The receptor grid is that developed in previous modeling exercises, particularly from the SO₂ monitoring site design study for Warren Station (TRC, 1991). This will ensure that concentration predictions will be made at points of previously modeled maximum concentrations.

To the north of Warren Station, 164 receptors were placed at elevated locations, mainly above 1600 feet (Figure 3-1). One hundred twenty-three (123) receptors cover elevated terrain within about 3 km of Warren Station. Four receptors are located at four of the seven SO₂ monitoring site locations.

An array of 246 receptors was located to the south of Warren Station, ranging in elevation from 1400 to 1920 feet (Figure 3-2). Most are located within 4 km of Warren Station, including three at the remainder of the seven SO₂ monitoring site locations.

3.3 Meteorological Data

Onsite meteorological data from two towers (Conewango and Preston) will be used to drive the models. The instrumentation, their placement on the towers, and data acquisition and

TABLE 3-1
SOURCE CHARACTERISTICS FOR WARREN STATION

	Units 1 and 2 (Full Station Output)	Unit 1 or 2 Alone (½ Station Output)
Generator Capacity	94 MW	47.0 MW
Full Load Heat Rate (MMBtu/MWH)	12.66	12.66
Base Case SO ₂ Emission Factor	4.0 lb/MMBtu	4.0 lb/MMBtu
SO ₂ Emission Rate based on 4.0 lb/MMBtu	600 g/s	300 g/s
Proposed SO ₂ Emission Factor Limit	TBD ⁽¹⁾	TBD
Proposed SO ₂ Emission Rate	TBD	TBD
Stack Temperature	481 K ⁽²⁾	474 K ⁽³⁾
Stack Exit Velocity	13.5 m/s ⁽²⁾	7.7 m/s ⁽³⁾
UTM East Coordinate (km)	650.39	650.39
UTM North Coordinate (km)	4632.95	4632.95
Source Base Elevation (ft MSL)	1186	1186
Stack Height	61.0 m	61.0 m
Stack Diameter	4.72 m	4.72 m

(1) To Be Determined

(2) April 1994 revisions based on CEM data

(3) August 1994 based on CEM certification testing

TABLE 3-2
STACK PARAMETERS FOR THE UNITED REFINING SOURCES

Source	SO ₂ Emission Rate (g/s)	UTM East (km)	UTM North (km)	Base Elevation (ft)	Stack Height (m)	Stack Diameter (m)	Stack Temperature (K)	Exit Velocity (m/s)
Boiler House	28.73	655,660	4632.170	1,195	68.58	2.44	672.0	11.44
No. 4 Boiler	1.64	655,461	4632.394	1,195	45.72	1.70	505.4	12.37
FCC Charge Heater	1.89	655,450	4632.392	1,195	38.10	1.22	560.9	10.51
DHT1 Heater	0.13	655,906	4632.024	1,195	30.48	0.91	922.0	3.88
Prefract Reboiler (East)	0.44	655,865	4632.055	1,195	12.19	0.61	699.8	10.03
Prefract Reboiler (West)	0.44	655,860	4632.052	1,195	12.19	0.61	699.8	10.03
Old Reformer Heater	8.44	655,911	4632.022	1,195	45.72	1.89	699.8	10.43
Crude Heater	32.51	655,814	4632.110	1,195	45.72	2.59	699.8	15.09
Pretreater Heater	1.76	655,894	4632.129	1,195	51.82	1.89	588.7	3.84
New Reformer Heater	1.13	655,901	4632.028	1,195	45.72	2.13	533.2	6.65
Debut Reboiler	0.25	655,826	4632.095	1,195	30.48	0.85	922.0	12.70
FCC Regenerator	42.46	655,494	4632.454	1,195	45.72	2.13	533.2	15.21
No. 5 Boiler	<u>0.25</u>	655,887	4632.056	1,195	30.48	1.22	588.7	12.05
Total		120.07						

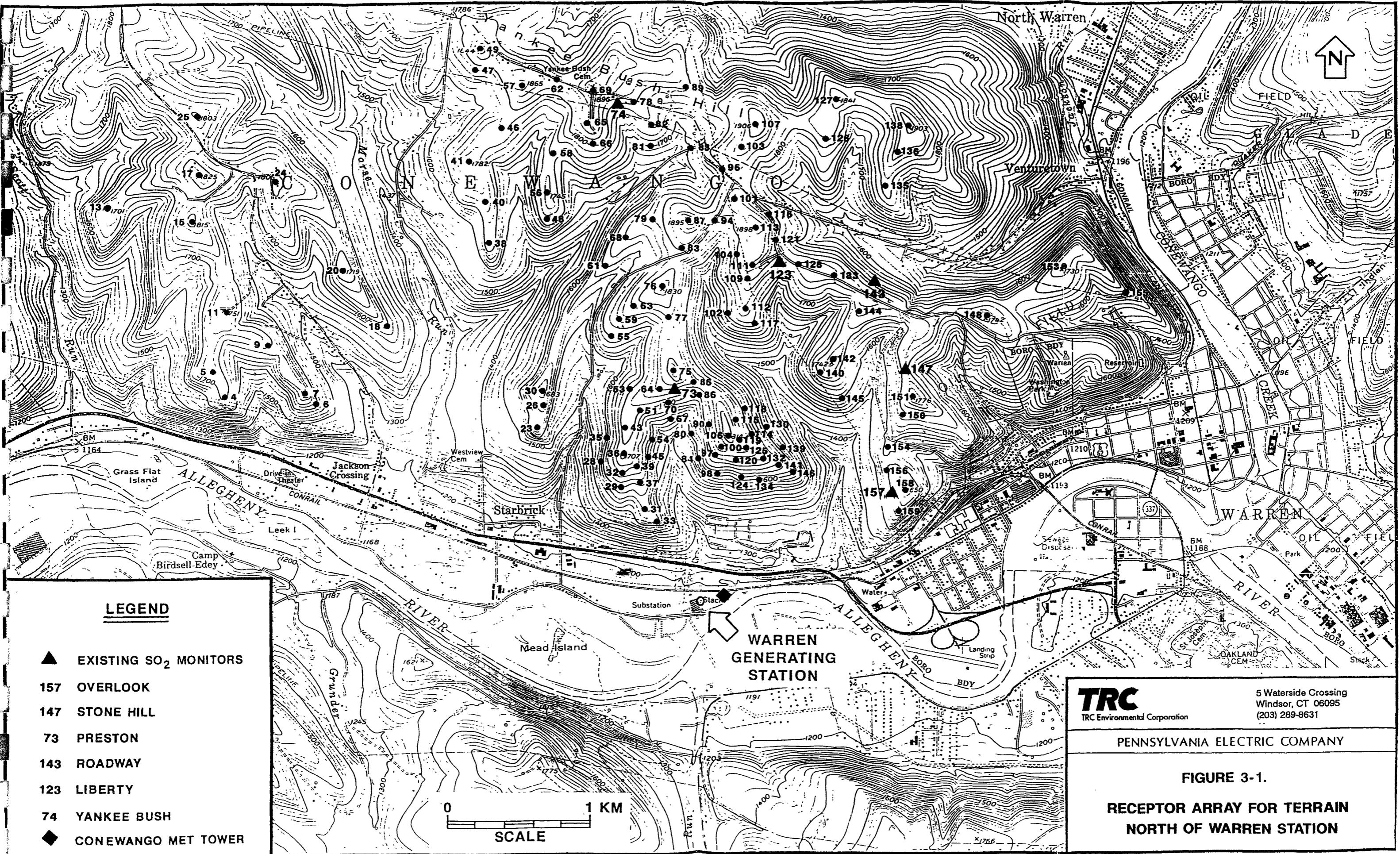


FIGURE 3-1.

RECEPTOR ARRAY FOR TERRAIN NORTH OF WARREN STATION

TRC
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5 Waterside Crossing
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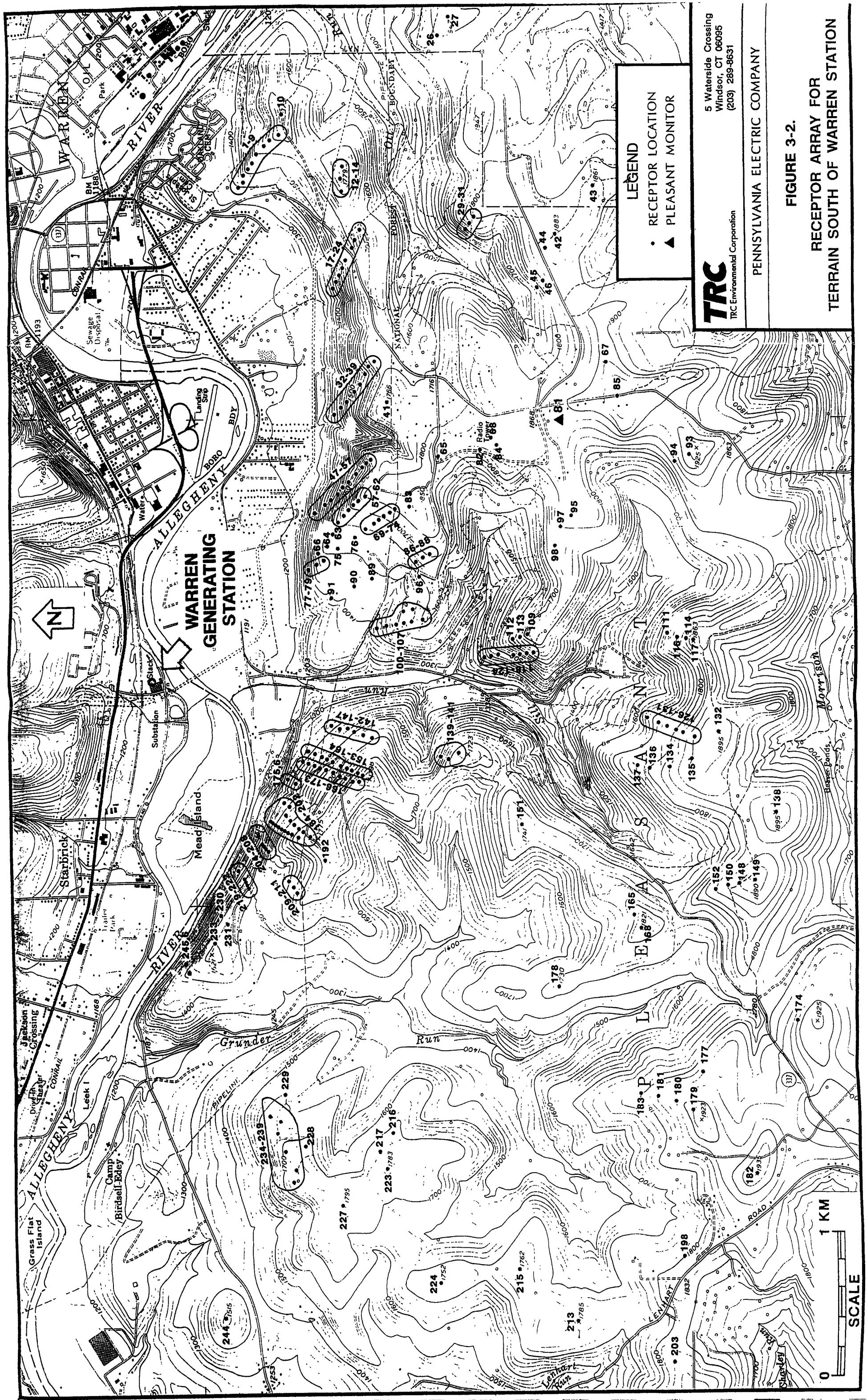


FIGURE 3-2. RECEPTOR ARRAY FOR TERRAIN SOUTH OF WARREN STATION

processing are consistent with current regulatory guidance. The tower site locations are shown in Figure 3-1. Table 3-3 shows the tower elevations and location coordinates.

3.3.1 Site Descriptions

The Conewango tower is located 300 meters east of Warren Station at a base elevation of 1190 feet. There are sensors at three levels on the Conewango tower: 58.5 m, 125 m, and 150 m. The top level sensor (150 m) will be the primary source of wind direction data for estimating the transport direction. The 58.5 m level will be the primary source for wind speed.

The Preston tower is located approximately 1.5 km north of Warren Station at a base elevation of 1760 feet. The 10 m level sensor will provide measurements to determine atmospheric stability class and ambient temperature.

3.3.2 Data Application

The compliance modeling analyses will be performed using the same meteorological data that were used for the model performance comparison analyses. All wind speeds greater than the anemometer threshold speed (0.5 m/s) but less than 1 m/s will be adjusted to 1 m/s prior to use by the models. Table 3-4 summarizes the meteorological database prior to any processing. Percent data capture exceeds 96 percent for most parameters. Meteorological input files were created using measurements from the two onsite towers at Conewango and Preston for the one-year period, from March 1, 1993 through February 28, 1994. The files were defined to provide wind and stability values that best characterize the plume and transport environment of Warren Station.

Table 3-5 summarizes the meteorological files which will provide wind speed, wind direction and atmospheric stability values for the models. Table 3-5 also shows the substitution hierarchy that will be used to replace missing data. The designations C-150, C-125, C-59 and P-10 represent, in order, data from the 150 m, 125 m and 58.5 m levels on the Conewango tower, and the 10 m level on the Preston tower. The substitution scheme works in descending order; the top listed value is the primary data source for each input variable. The National Weather Service (NWS) office in Bradford, Pennsylvania is the final substitution if all other data are missing. During 1993, however, Bradford stopped taking nighttime observations. TRC

TABLE 3-3
METEOROLOGICAL MONITORING SITES FOR WARREN STATION

Location Description	Elevation		Parameters* Monitored	
	MSL (ft.)	Above Grade (ft.)		
(a) Conewango 150 Meter Tower				
Tower UTM - N = 4,633,016 meters - E = 650,611 meters				
Tower Base Plate	1,190	--		
Intermediate Sensor Level	1,382	192 (58.5 m)	WD, WS	
Upper Sensor Level	1,600	410 (125 m)	WD, WS	
Top Sensor Level	1,682	492 (150 m)	WD, WS	
(b) Preston 10 Meter Tower				
Tower UTM - N = 4,634,470 meters - E = 650,080 meters				
Tower Base Plate	1,760	--		
Sensor Level	1,793	33 (10 m)	WD, WDST, WS, AT	

* Parameter Identifiers

WD = wind direction

WDST = standard deviation of wind direction (sigma theta)

WS = wind speed

AT = ambient temperature

TABLE 3-4

SUMMARY OF MEASURED METEOROLOGICAL DATA
PRIOR TO ANY DATA PROCESSING

Site	Param.	Total Hours	Valid Hours	Invalid Hours	Percent Capture	Max.	Min.	Avg.	Std. Dev.	Units
Conewango	WS150	8760	8630	130	98.5	30.80	0.60	8.63	4.9	mph
Conewango	WS125	8760	8660	100	98.9	29.70	0.50	8.03	4.7	mph
Conewango	WS59	8760	8596	164	98.1	26.60	0.60	6.36	4.2	mph
Conewango	WD150	8760	8635	125	98.6	360.00	0.00	195.33	92.7	degrees
Conewango	WD125	8760	8662	98	98.9	359.00	0.00	197.04	94.6	degrees
Conewango	WD59	8760	8638	122	98.6	359.00	0.00	203.54	88.7	degrees
Preston	WS10	8760	8509	251	97.1	26.40	0.50	6.76	3.6	mph
Preston	TEMP	8760	8552	208	97.6	86.60	-22.50	44.55	20.3	°F
Preston	WDST	8760	7984	776	91.1	91.00	2.00	19.90	13.1	degrees

WS150 = Wind speed at 150 m

WS125 = Wind speed at 125 m

WS59 = Wind speed at 58.5 m

WD150 = Wind direction at 150 m

WD125 = Wind direction at 125 m

WD59 = Wind direction at 58.5 m

WS10 = Wind speed at 10 m

WDST = Standard deviation of the horizontal wind direction (sigma theta)

TABLE 3-5

METEOROLOGICAL DATA SOURCES, SUBSTITUTION HIERARCHY
FOR MISSING DATA, AND HOURS OF DATA TO BE USED FOR MODELING

Parameter	Sensor Level/ Source	Number of Hours Used
Wind Direction	C-150	8635
	C-125	33
	C-59	1
	Jamestown/Bradford NWS	91
Stack Top Wind Speed	C-59	8596
	C-125	71
	C-150	2
	Jamestown/Bradford NWS	91
Plume Height Wind Speed	C-150	8630
	C-125	33
	C-59	6
	Jamestown/Bradford NWS	91
Atmospheric Stability	P-10	7984
	Jamestown/Bradford NWS	776
Temperature	P-10	8552
	Jamestown/Bradford NWS	208

C-150 = Conewango 150 m level

C-125 = Conewango 125 m level

C-59 = Conewango 58.5 m level

P-10 = Preston 10 m level

NWS = National Weather Service

determined that Jamestown, New York is the next closest representative site that could be used for data substitution. Jamestown is used only if Bradford is missing.

For stability class, the EPA recommended scheme based on the use of site-specific 10 m wind speed and sigma theta is used as the primary approach. The default roughness length of 15 cm is used. On-site wind profile exponents are determined from the Conewango tower data.

Table 3-5 shows that in the performance evaluation study the primary data source was used for more than 90 percent of the hours in the year. Except for atmospheric stability, substitution below the secondary level was seldom necessary. NWS data from the Jamestown and Bradford airports were used for about 1 percent of the hours for wind data and for up to 10 percent of the hours for atmospheric stability.

3.4 Background Concentrations

Background concentrations will represent contributions from remote or unidentified sources that are not explicitly modeled in the compliance analysis. These will be determined using the full year of monitored data collected from all seven monitors for the model evaluation study.

For the compliance modeling, the background concentration will vary hourly, depending on the value of the lowest concentration monitored for each hour. However, the background concentration for the hours identified by PaDER as having been impacted by United Refining (Higgins, 1994) will be calculated differently. The background concentration for each of those hours will be determined as the average of the background concentration values calculated for the remaining hours of measured SO₂ data.

3.5 Model Options

Tables 3-6 and 3-7 summarize the results of a special plume height analysis conducted to determine anemometer height inputs to the models for the model performance evaluation study. Tables 3-8 through 3-10 present the other options to be used in the RTDM, LAPPES, and MPTER models, respectively. All options will be activated in accordance with EPA

TABLE 3-7
SOURCE DEPENDENT MODEL OPTION DATA

Source	Anemometer Height (m)*			Wind Speed Profile Exponents					
	#1 ^(a)	#2 ^(b)	PR004 ^(c)	1	2	3	4	5	6
Crude Heater	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
Boiler House	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
FCC Generator	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
Old Heater	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
Boiler 4	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
New Heater	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
Boiler 5	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
FCC Heater	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
Preheater	57.0	146.9	2	0.17	0.17	0.18	0.32	0.49	0.40
Debut Boiler	57.0	123.4	2	0.17	0.17	0.18	0.32	0.49	0.40
DHT1 Heater	57.0	57.0 ^(d)	1	0.17	0.17	0.18	0.32	0.49	0.40
Reboiler East	57.0	57.0 ^(d)	1	0.17	0.17	0.18	0.32	0.49	0.40
Reboiler West	57.0	57.0 ^(d)	1	0.17	0.17	0.18	0.32	0.49	0.40
Warren Station	59.7	151.2	2	0.17	0.17	0.18	0.32	0.49	0.40

* Above stack base elevation

(a) #1 for RTDM; single anemometer height for LAPPES and MPTER

(b) #2 for RTDM

(c) Dilution wind speed option number for RTDM

(d) Anemometer height for both stack top height and plume height, RTDM

TABLE 3-8
RTDM MODEL OPTIONS

Model Parameters:

- PR0001: Horizontal Scale is 1000.000 Meters Per User Unit
 - PR0002: Vertical Scale is .305 Meters Per User Unit
 - PR0003: Wind Speed Scale is .447 m/sec Per User Unit
 - PR0004: Anemometer #1 Height Above ZA (Used for Plume Rise) is (see Table 3-7)
 If Available, Anemometer #2 Height Above ZA (Used for Plume Dilution) is (see Table 3-7)
 Dilution Wind Speed Option is (see Table 3-7) (If 0, One Wind Speed—at Stack Height—is Used for Plume Rise and Dilution
 If 1, Wind Speed at Level #1 is Extrapolated to Stack-Top Height for Plume Rise and to Plume Height for Dilution
 If 2, Wind Speed at Level #1 is Extrapolated to Stack-Top Height for Plume Rise, and the Speed at Level #2 is Extrapolated to Plume Height for Dilution)
 ZA (Height in Meters Above Stack Base Elevation where the Wind Speed Profile is Assumed to Originate) = .000
 - PR0005: Default Wind Speed Profile Exponents as a Function of Stability Class (1-6, respectively): (see Table 3-7)
 - PR006: Dispersion Coefficients are Briggs Rural/ASME-1979 (Unless Replaced by On-Site Turbulence Data)
 - PR009: Partial Plume Penetration of Mixing Lids is Not Being Used
 - PR010: Buoyancy-Enhanced Plume Dispersion is Used; Parameter Alpha is: 3.162
 - PR011: Unlimited Mixing Height Used for Stable Condition
 - PR012: Transitional Plume Rise is Used
 - PR013: Plume Path Coefficients for Stability Classes 1-6: .500, .500, .500, .500, .500, .500
 - PR014: Default Vertical Potential Temperature Gradients Used for Stable Plume Rise (Classes 5 & 6): .0200, .0350
 - PR015: Stack-Tip Downwash is Used
 - PR016: Y-Component Turbulence Intensity Values are Not Provided; Stability Class is Used to Obtain Sigma-Y.
 - PR017: Z-Component Turbulence Intensity Values are Not Provided; Stability Class is Used to Obtain Sigma-Z.
 - PR018: Hourly Vertical Potential Temperature Gradients are Not Provided to Determine Stable Plume Rise; Use Default Values (see PR014)
 - PR019: Hourly Vertical Potential Temperature Gradients are Not Provided to Determine HCRIT; Use Default Values (see PR014)
 - PR020: Wind Direction Shear is Not Used in Computation of Sigma-Y.
 - PR021: Hourly Values of Wind Speed Profile Exponent are Not Provided; Use Defaults (see PR005)
 - PR022: Partial Reflection Algorithm is Being Used; Keyword Terrain Must be Used to Read in Terrain
 - PR023: Sector Averaging is Used for All Stabilities
 Sector Widths (Deg) for Stabilities 1-6 are: 22.50, 22.50, 22.50, 22.50, 22.50, 22.50
 - PR024: Constant Values Specified in Tables 3-1 and 3-2 will be used
 - PR025: Detailed Information About Each Case will Not Be Printed
-

TABLE 3-9
LAPPES MODEL OPTIONS

Option	Option List	Option Specification 0 = Ignore Option 1 = Use Option
<u>Technical Options</u>		
1	Terrain Adjustments	1
2	Do Not Include Stack Downwash Calculations	0
3	Do Not Include Gradual Plume Rise Calculations	1
4	Calculate Initial Plume Size	1
<u>Input Options</u>		
5	Read Met Data from Cards	0
6	Read Hourly Emissions	0
7	Specify Significant Sources	0
8	Read Radial Distances to Generate Receptors	0
<u>Printed Output Options</u>		
9	Delete Emissions with Height Table	1
10	Delete Met Data Summary for Average Period	1
11	Delete Hourly Contributions	1
12	Delete Met Data on Hourly Contributions	1
13	Delete Final Plume Rise Calc on Hourly Contributions	1
14	Delete Hourly Summary	1
15	Delete Met Data on Hourly Summary	1
16	Delete Final Plume Rise Calc on Hourly Summary	1
17	Delete Avg-Period Contributions	1
18	Delete Averaging Period Summary	1
19	Delete Avg Concentrations and Hi-5 Tables	0
<u>Other Control and Output Options</u>		
20	Run is Part of a Segmented Run	0
21	Write Partial Conc to Disk or Tape	0
22	Write Hourly Conc to Disk or Tape	1
23	Write Avg-Period Conc to Disk or Tape	0
24	Punch Avg-Period Conc onto Cards	0
25	Complex Terrain Option	6

Anemometer Height is: (see Table 3-7)

Exponents for Power-Law Wind Increase with Height are: (see Table 3-7)

Terrain Adjustments are: .500, .500, .500, .500, .000, .000

Zmin is: 10.0

TABLE 3-10
MPTER MODEL OPTIONS

Option	Option List	Option Specification 0 = Ignore Option 1 = Use Option
<u>Technical Options</u>		
1	Terrain Adjustments	1
2	Do Not Include Stack Downwash Calculations	0
3	Do Not Include Gradual Plume Rise Calculations	1
4	Calculate Initial Plume Size	1
<u>Input Options</u>		
5	Read Met Data from Cards	0
6	Read Hourly Emissions	0
7	Specify Significant Sources	0
8	Read Radial Distances to Generate Receptors	0
<u>Printed Output Options</u>		
9	Delete Emissions with Height Table	1
10	Delete Met Data Summary for Average Period	1
11	Delete Hourly Contributions	1
12	Delete Met Data on Hourly Contributions	1
13	Delete Final Plume Rise Calc on Hourly Contributions	1
14	Delete Hourly Summary	1
15	Delete Met Data on Hourly Summary	1
16	Delete Final Plume Rise Calc on Hourly Summary	1
17	Delete Avg-Period Contributions	1
18	Delete Averaging Period Summary	1
19	Delete Avg Concentrations and Hi-5 Tables	0
<u>Other Control and Output Options</u>		
20	Run is Part of a Segmented Run	0
21	Write Partial Conc to Disk or Tape	0
22	Write Hourly Conc to Disk or Tape	1
23	Write Avg-Period Conc to Disk or Tape	0
24	Punch Avg-Period Conc onto Cards	0
<u>Default Option</u>		
25	Use Default Option	0

Anemometer Height is: (see Table 3-7)

Exponents for Power-Law Wind Increase with Height are: (see Table 3-7)

Terrain Adjustments are: .000, .000, .000, .000, .000, .000

guidance. They will be the same as those used in the model performance evaluation study (except that constant rather than variable hourly emission rates will be used).

3.6 Modeling of Warren Station and United Refining

As noted above, the models to be used in the compliance analyses are the regulatory models RTDM and MPTER, and the Penelec developed model LAPPES. MPTER will be used to predict concentrations in simple terrain for all sources.

The source data to be used by each applicable model for the corresponding sources are shown in Tables 3-1 and 3-2. Warren Station will be modeled at 100 percent load because previous studies have shown this load to produce maximum concentration predictions. The towers and sensors from which the meteorological input data will be obtained to model each source are shown in Table 3-5. The 417-point receptor grid (Figures 3-1 and 3-2), will be used with all models to predict impacts from all sources combined.

3.6.1 Warren Station

Warren Station will be modeled with the LAPPES and MPTER models for the reasons discussed above. The MPTER model will be used to predict SO₂ impacts at all receptors (Figures 3-1 and 3-2) with elevations below stack top, and LAPPES will predict concentrations at receptors located only within the study region (Figure 2-1), with elevations above stack top. The hourly concentration output files will be retained for final processing involving all sources to obtain total impacts at each receptor.

3.6.2 United Refining

United Refining will be modeled with the regulatory models RTDM and MPTER at all receptors. The MPTER and RTDM models will be used to predict concentrations at all receptors with elevations below and above stack top, respectively. Intermediate terrain will be modeled with the RTDM/MPTER combined model. These hourly concentrations output files will also be retained for final processing with the output files from the Warren Station simulations.

3.6.3 Bias Adjustment Factors

The model evaluation protocol for Warren Station called for testing the LAPPES model to determine if it predicts the upper end of the frequency distribution within defined confidence intervals. If the LAPPES model either significantly under- or over-predicts the concentrations compared to the observed database, factors would be developed to adjust the predicted concentrations toward the observed concentrations. The adjustment factors would be calculated separately for the 3-hour and 24-hour averaging periods.

According to the model evaluation protocol, adjustment factors would be employed if the difference between the observed and predicted values were significant, based on two criteria:

- 1) "The average of the "Top N" predicted and observed values will be compared, using the bootstrap technique, to determine whether the difference is significant at a 95 percent confidence level. The data set will be randomly sampled 1,000 times to determine the 95 percent confidence interval."
- 2) If the average of the "Top N" predicted values is less than 90 percent of the observed average, the difference will be considered significant regardless of the statistical test."

3.6.4 Initial Bootstrap Analysis

As noted previously, anomalously high SO₂ concentrations attributable to contributions from SO₂ sources at United Refining were occasionally recorded across all or most of the monitoring network. For the model comparison study, TRC and Penelec developed a procedure to identify the hours in which United Refining's emissions had the potential to significantly impact the measured concentrations. This procedure was used to exclude a limited amount of the anomalous data from the model performance comparison database (Schmidt, K., 1994). The procedure was approved by PaDER in April 1994 and TRC identified 11 potential anomalous impact "events" in May 1994. However, TRC only proposed to eliminate the hours associated with those four events that were most clearly related to United Refining's impacts. PaDER concurred with the removal of those four events from the database (Simonson, R., 1994).

Using the remaining database, the model comparison study results (TRC, 1994) showed that the Top N 3-hour and 24-hour average concentrations predicted by LAPPES were less than 90 percent of the observed values. This would subject the LAPPES predictions to an adjustment factor to bring them closer (increase) to the observed values. Meanwhile, PaDER conducted an

independent study to evaluate United Refining's effects on the SO₂ database (Higgins, 1994). This study made use of continuous emissions monitoring (CEM) data from United Refining. PADER's study results corroborated TRC's earlier conclusions, and identified United Refining's influence on a larger number of hours than those TRC eliminated from the database. These additional hours were then also removed from the database and a bootstrap reanalysis was performed on the revised model performance comparison database, as discussed below.

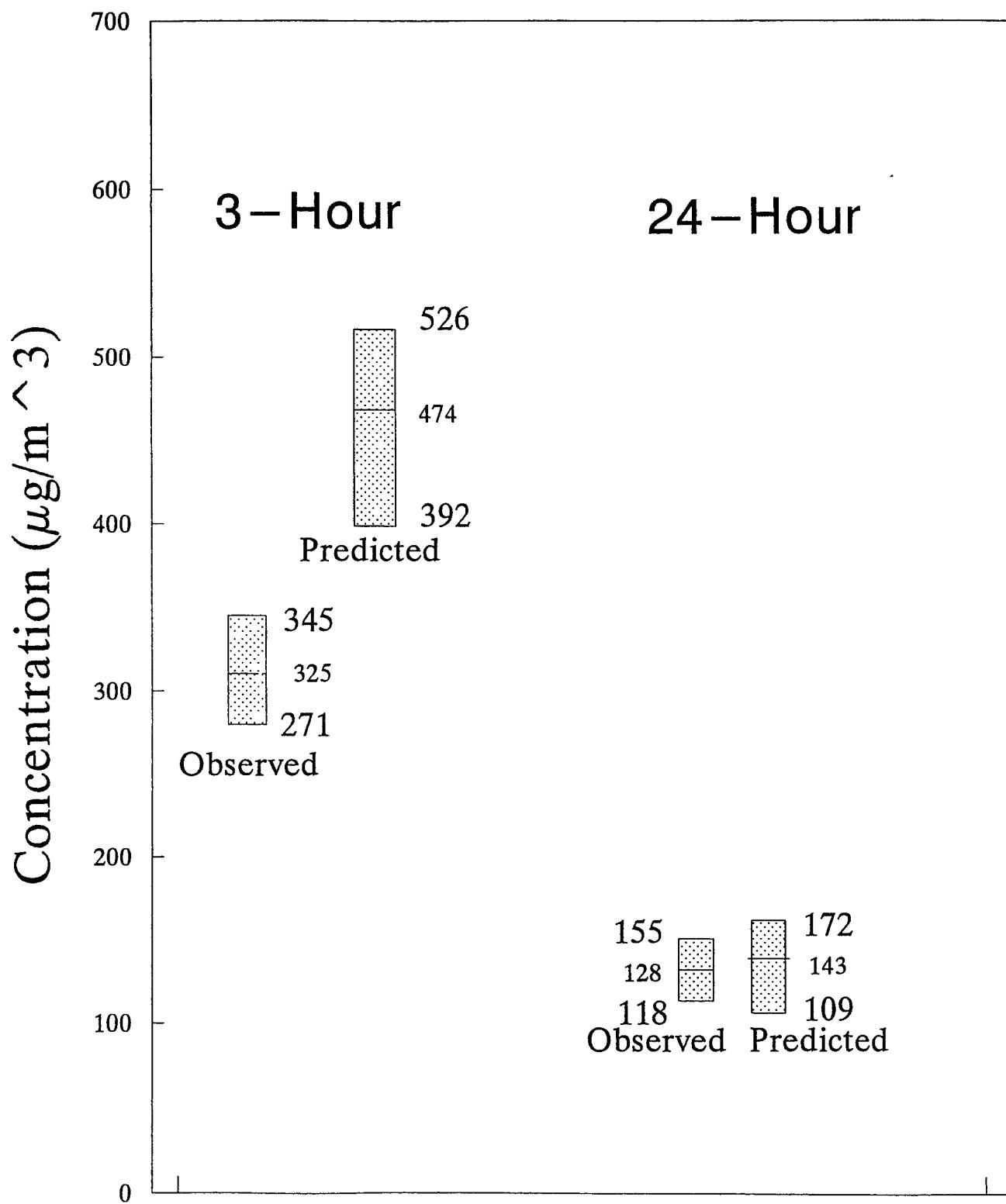
3.6.5 Bootstrap Reanalysis

The statistical bootstrapping procedure was run by randomly sampling 3-day block periods by season, with replacement, to obtain 1000 simulations of 8760 hours each. The medians of the simulated Top N predicted and measured 3-hour and 24-hour average concentrations were calculated for each simulated year. The results are presented in Figure 3-3 which represents the 95 percent confidence intervals for the 1,000-year bootstraps of the Top N predicted and observed 3-hour and 24-hour average concentrations.

After the additional hours of United Refining's influence were eliminated from the database of observed SO₂ concentrations, the median values of the Top N 3-hour averages were calculated to be 325 and 474 $\mu\text{g}/\text{m}^3$ for the observed and LAPPES-model-predicted concentrations, respectively. The median values of the Top N 24-hour averages were calculated to be 128 and 143 $\mu\text{g}/\text{m}^3$ for the observed and LAPPES-model-predicted concentrations, respectively.

The preceding results mean that the LAPPES model largely over-predicted the Top N concentrations for the 3-hour averaging period and slightly over-predicted the Top N concentrations for the 24-hour averaging period. Since the median predicted value for LAPPES is only 1.46 times the observed median value for the 3-hour average, no over-prediction bias adjustment factor is needed. For the 24-hour averaging period, the LAPPES model shows both some over-prediction and some under-prediction in Figure 3-3. The median predicted value for the LAPPES model is slightly larger than the median observed value. Therefore, no under- or over-prediction bias adjustment factors are required.

Figure 3–3
Bootstrap Analysis Results



3.7 Compliance Evaluation

The modeling will be conducted for evaluating compliance with the NAAQS for SO₂. The modeling results will be evaluated to assure that predicted impacts from Warren Station plus the background concentrations and concentrations from United Refining's sources do not exceed the 3-hour, 24-hour and annual average SO₂ NAAQS.

4.0 REFERENCES

1. EPA, "User's Guide for MPTER - A Multiple Point Gaussian Dispersion Algorithm with Optional Terrain Adjustment," April 1980.
2. EPA, "Interim Procedures for Evaluating Air Quality Models (Revised)," 450/4-84-023, September 1984.
3. EPA, "User's Guide to the Rough Terrain Diffusion Model (RTDM) (Rev. 3.20)," Doc. #P-D535-585, July 1987.
4. Higgins, "Warren Generating Station Model Comparison Study," memo to James Salvaggio, PaDER, September 1994.
5. Schmidt, K., "Letter from Pennsylvania Electric Company to Robert Simonson, Pennsylvania Department of Environmental Resources," April 1994.
6. Slade, J., "Letter from John Slade, PaDER to Vincent Brisini, Penelec," August 1994.
7. Simonson, R., "Letter from Robert Simonson, Pennsylvania Department of Environmental Resources to Michael Anderson, TRC," May 1994.
8. TRC, "Monitoring Network Design Analysis Using Conewango Tower Data for Warren Model Performance Comparison," October 1991.
9. TRC, "Protocol for the Model Performance Comparison Study for Penelec's Warren Generating Station," September 1992.
10. TRC, "Final Report on the Model Performance Comparison Study for Warren Generating Station," May 1994.

APPENDIX

WARREN GENERATING STATION MODEL COMPARISON STUDY

(HIGGINS, 1994)

*Revd. 9/1/94
Kes*

COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Resources
September 1, 1994
Tel: 814/332-6940
Fax: 814/332-6831

SUBJECT: Warren Generating Station
Model Comparison Study

TO: James Salvaggio
Director
Bureau of Air Quality Control
MSSOB

FROM: Francis C. Higgins
Program Specialist Supervisor
Air Quality Control
Northwest Regional Office

THROUGH: John Slade
Chief
Division of Permits
Bureau of Air Quality Control
MSSOB

Please find attached the United CEM and Penelec monitor comparisons which potentially influenced the model comparisons. In short, Penelec should remove hours which URC high concentrations combined with wind direction, wind variability, and wind speed may influence the model.

Attachment

cc: Warren District Office
File #62-012

PENELEC MODEL EVALUATION

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COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Resources
August 31, 1994
814/723-3273
Fax: 814/723-1515

SUBJECT: Model Comparison Study
Warren Generating Station

TO: File 62-000-012

FROM: William Snyder
Air Quality Specialist
Air Quality Control
Warren District Office

THROUGH: Larry Wonders
Francis Higgins
James Mosier
Ron Gray

I. Introduction

In May of 1994, TRC Environmental Corporation released the "FINAL REPORT ON THE MODEL PERFORMANCE COMPARISON STUDY FOR WARREN GENERATING STATION" on behalf of The Pennsylvania Electric Company (Penelec). The Warren Generating Station is located in an area which has been designated as a non-attainment area for sulfur dioxide (SO₂). Because of the non-attainment status, The Pennsylvania Department of Environmental Resources (PADER) and Penelec have entered into a Consent Order and Agreement which stipulated that Penelec conduct dispersion modeling. The comparison report for dispersion modeling compared three models: 1. the Multiple Point with Terrain model (MPTER) 2. the Rough Terrain Diffusion Model (RTDM) 3. the Large Area Power Plant Effluent Study (LAPPES). The MPTER and RTDM models are methods currently approved, and in the absence of an approved alternative they are the currently required models. Based on Field Studies conducted from 1967 to 1972, Penelec believes their model is the most suitable model for the Warren terrain. Modeling protocol was specified for the project and was approved by the Environmental Protection Agency (EPA) and PADER. Seven monitor sites were included within the monitoring network. Acorn Site (1) is located at UTM (E) 650.57, UTM (N) 4634.09 at an elevation of 1,750 feet. Blair Site (2) is located UTM (E) 647.14, UTM (N) 4632.08 at an elevation of 1,680 feet. Dee Site (3) is located at UTM (E) 650.67, UTM (N) 4630.27 at an elevation of 1,680 feet. Hemlock Site (4) is located at UTM (E) 649.32, UTM (E) 4631.88 at an elevation of 1,720 feet. Knob Site (5) is located at UTM (E) 651.85 UTM (N) 4634.40 at an elevation of 1,776 feet. Overlook Site (6) is located at UTM (E) 651.69, UTM (E) 4633.80 at an elevation of 1,600 feet. The final site is Preston Site (7) located at UTM (E) 650.08, UTM (N) 4634.47 at an elevation of 1,760 feet. Meteorological conditions were monitored and recorded at two locations the Conewango tower located at UTM (E) 650.61, UTM (N) 4,633.02 with three sensors located at elevations of 1,382 feet (58 meters above grade), 1,600 feet (125 meters above grade), and 1,682 feet (150 meters above grade). A second tower was located at the Preston Site with a sensor level at 1,793 feet (10 meters above grade).

TRC maintains that results of the study indicate that: 1. LAPPES best predicts air quality impact in the Warren area 2. the LAPPES model scored best as

specified in the protocol 3. a large percentage of peak SO₂ concentrations measured by the network were attributable to other sources.

This project is complicated by the proximity of another nearby major SO₂ producing source. United Refining Company, Inc. (URC) owns and operates a petroleum refining facility which processes high sulfur crude oil. The refinery stacks are located between UTM (E) coordinates 655.660 and 655.887 and UTM (N) coordinates 4632.170 and 4632.056 with base elevations of 1,195 feet, a lowest stack height of 12.19 feet above grade and a highest stack of 68.58 feet above grade. Four Continuous Emission Monitors (CEMs) monitor SO₂ concentrations at URC. CEMs 0128710 monitors the boilerhouse, No. 4 boiler, FCC charge heater, DHT1 heater, prefraction reboilers (east and west), old reformer heater, pretreater heater, combo flare (blowdown), DHT2 heater and SRU2 incinerator. CEMs 0058710 monitors the vacuum heater, new reformer heater, debut. reboiler, No. 5 boiler, and SAT gas KVG. CEMs 0308810 monitors the boilerhouse, DHT1 heater, Prefraction reboilers (east and west), old reformer heater, pretreater heater, combo flare (blowdown), DHT2 heater, and SRU2 incinerator. CEMs 0298810 monitors the crude (Wheco) heater. CEM codes which may appear under URC CEM numbers in the tables are as follows: 13 = Process Down, 16 = Primary Analyzer Malfunction, 18 = Data Handling System Malfunction. Terrain also complicates this study due to the meteorological impact of hill and valley winds and the river effects.

II. Methods

In response to the Final Report on the Model Performance Comparison Study for Warren Generating Station, PADER has compared the reports generated by Continuous Emission Monitors (CEMs) at URC and the 100 highest concentrations at each of the seven monitor sites of Penelec's. Meteorological data was used only from the Conewango Tower as provided by Penelec. Eleven episodes were examined in detail. Consideration was given to SO₂ concentrations at URC and wind direction. The top 100 concentrations were taken from table A-1 of the study and rearranged to a chronological order. Data was not converted; however, a direct unit to unit conversion can be accomplished by the conversion factor of 1 ppm = 2,600 micrograms/cubic meter. URC's CEM monitors record in ppm, and Penelec's monitors record in micrograms per cubic meter. URC's SO₂ levels are limited to a maximum of 162 ppm as measured at each monitor. The days and hours of the study were tabulated and the possible days of impact on the monitor sites by URC were eliminated. Eliminations were based on wind direction between 70 and 140 degrees which would exclude influence on Dee Site (most southerly) and Preston (most northerly). Eliminations were then further expanded to hours of wind variability within one hour before and one hour after the hour. Eliminations were then further expanded based on low dispersion due to low wind speed influence (less than 2 MPH). Remaining dates probably are not attributed to URC.

III. Results

Specific dates were identified in the Penelec report as East Wind Events. Within these East Wind Events there are 11 episodes. These dates and hours were compared with CEM data from URC and wind direction from Penelec's Conewango Met. data (Appendix A). The Department concurs with Penelec on most of these hours. Specifically, Episode 1 on January 20, 1994; Episode 2 on February 17-18, 1994; Episode 3 on April 7, 1993; Episode 4 on April 29, 1993; Episode 6 on October 7, 1993; Episode 7 on October 8, 1993; Episode 8 on October 25, 1993; Episode 9 on October 25-26, 1993; Episode 10 on December 13-14, 1993; and Episode 11 on

JUNE 18 even

ND, 24, 1994 - 0052

December 27, 1993 can all be associated with high SO₂ emissions at URC and wind directions which would favor impact on Penelec's monitors. Only one episode, Episode 5 on June 17-18, 1993 which Penelec's study identified as probably related to URC is in question. Although wind direction would implicate URC, SO₂ emissions from URC at the time were low.

Of 653 possible impact hours examined in Appendix B only 57 hours had total concentrations at URC less than 100 ppm but greater than 50 ppm. There were only 15 hours of the 653 hours which were less than 50 ppm but greater than 25 ppm, and only 14 hours of the 653 hours which were less than 25 ppm. Of the total number of hours examined, there were 140 hours where a monitor at URC was offline, and 427 hours showed concentration levels at a URC CEM greater than 100 ppm. A URC CEM indicated a violation exceedance greater than 162 ppm in 95 of the 653 possible impact hours.

Although data which was examined from the highest 100 concentrations as recorded at the Penelec monitors consisted of 653 CEM/monitor impact hours there were in actuality only 378 actual hours. Of these 378 hours 92.2% or 347 of the hours examined could have been influenced by URC as determined by the following criteria: 288 hours (76.6%) of the 347 hours attributed to URC are based on wind direction; 53 hours (14.0%) are based on wind variability; 6 hours (1.6%) are based on wind speed. The remaining 31 hours could not be attributed to URC. Of these remaining hours, many are clearly attributable to influence by the Penelec Generating Station. This data can be found in Appendix D.

IV. Conclusions

The model clearly does not take into consideration many hours of impact by excursions at URC.

V. Recommendations

Exclusion criteria should be expanded to insure wind direction, wind variability, wind speed, and upset or high concentrations are eliminated from influencing the models, and the model comparisons should be reassessed.

8.7% 50 < ppm > 100

2.3% 25 < ppm > 50

2.1% ppm < 25

APPENDIX A

Date: March 31, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing
02	0	5	3	4	12	3.00	No
03	0	6	4	5	15	3.75	No
04	0	10	4	7	21	5.25	No
05	40	10	43	19	112	28.00	No
06	47	40	57	68	212	53.00	No
07	47	36	57	88	228	57.00	No
08	29	36	20	76	161	40.25	No
09	24	7	8	42	81	20.25	No

Penelec
Conewango
Wind Direction
58M 125 150

Date: April 6, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing
02	0	0	4	120	124	31.00	No
03	0	0	4	116	120	30.00	No
04	0	5	4	109	118	29.50	No
05	34	34	42	117	227	56.75	No
06	42	35	58	126	261	65.25	No

Penelec
Conewango
Wind Direction
58M 125 150

Date: April 7, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing
01	0	207	7	1	215	53.75	No
02	0	167	8	1	176	44.00	No
03	1	92	8	1	102	25.50	No

Penelec
Conewango
Wind Direction
58M 125 150

198	56	109
135	68	102
117	62	111

Date: April 7, 1994 (cont.)

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
04	2	18	9	0	29	7.25	No	150 60 109
05	36	64	46	0	146	36.50	No	112 62 107
06	45	130	61	0	236	59.00	No	94 63 102
07	50	188	62	0	300	75.00	No	110 70 89

Date: April 24, 1994

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
02	6	8	24	53	81	20.25	No	109 160 64
03	6	6	25	54	91	22.75	No	112 165 88
04	7	5	63	29	104	26.00	No	138 197 77
05	25	7	63	36	131	32.75	No	126 197 75

Date: April 28, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
03	13	12	13	9	47	11.75	No	135 66 135
04	50	11	13	9	83	20.75	No	172 62 172
05	51	10	11	15	87	21.75	No	149 62 149
06	42	9	56	32	139	34.75	No	166 62 166
07	6	40	95	34	175	43.75	No	122 67 122
08	35	69	121	30	255	63.75	No	99 97 99
09	148	127	86	12	373	93.25	No	70 149 70

Date: April 29, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	4	14	27	20	65	16.25	No	181 62 84
02	4	22	22	14	62	15.50	No	184 64 75
03	13	27	17	29	86	21.50	No	156 61 78
04	50	31	15	30	126	31.50	No	176 59 71
05	51	15	32	52	150	37.50	No	154 61 71
06	42	11	67	74	194	48.50	No	123 66 77
07	6	22	67	76	171	42.75	No	154 60 91
08	35	22	50	103	210	52.50	No	235 58 111
09	148	25	20	97	290	72.50	No	89 60 101
10	17402P	26	28	93	321	80.25	No	287 295 252

Date: May 9, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
04	41	0	66	25	132	33.00	No	200 75 67
05	42	1	52	55	149	37.25	No	250 82 74
06	39	1	7	108	155	38.75	No	200 72 77
07	3	1	5	155	164	41.00	No	119 71 85
08	3	1	4	129	137	34.25	No	122 73 63

Date: June 17, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
24	0	0	78	0	24	19.50	No	24 80 111

Date: June 18, 1994

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	0	0	56	0	56	14.00	No	112 66 112
02	0	0	59	0	59	14.75	No	226 75 226
03	9	1	37	0	47	11.75	No	46 81 46
04	40	1	32	0	73	18.25	No	170 64 170
05	40	28	30	0	98	24.50	No	189 68 189
06	31	27	41	0	99	24.75	No	195 64 195
07	0	29	49	35	113	28.25	No	158 71 158
08	11	8	45	84	148	37.00	No	93 350 93

Date: June 24, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	0	0	1	19	20	5.00	No	93 74 93
02	0	1	29	20	50	12.50	No	137 68 137
03	3	2	55	20	80	20.00	No	83 83 83

Date: August 9, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
23	266	102	15	48	431	107.75	No	120 73 67
24	200	82	12	58	352	88.00	No	113 74 62

Date: August 10, 1994

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	109	39	11	66	225	56.25	No	114 67 67
02	45	13	9	70	137	34.25	No	167 72 68
03	108	40	8	69	225	56.25	No	123 74 73
04	152	75	7	61	295	73.75	No	160 65 75
05	170	97	6	57	330	82.50	No	101 77 113

Date: August 14, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
24	198	127	11	4	340	85	No	259 82 55

Date: August 15, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	100	51	11	4	166	41.50	No	187 71 64
02	48	26	11	4	89	22.25	No	109 105 66
03	50	14	12	0	76	19.00	No	68 81 74
04	48	30	11	0	89	22.25	No	76 85 95
05	47	66	10	0	123	30.75	No	77 95 98
06	8	67	10	0	85	21.25	No	86 81 76
07	8	51	11	0	70	17.50	No	77 43 23

----- August 22, 1993 -----

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
21	9	12	10	106	137	34.25	No	229 73 59
22	9	13	11	143	176	44.00	No	116 70 65
23	9	13	11	171	204	51.00	No	116 74 70
24	9	13	11	171	204	51.00	No	138 68 64

Date: August 23, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	11	14	11	156	192	48.00	No	143 69 74
02	12	15	13	151	191	47.74	No	177 70 64
03	13	22	13	139	187	46.75	No	116 69 72
04	21	63	12	132	228	57.00	No	150 64 67
05	49	64	10	116	239	59.75	No	223 61 61
06	49	59	10	109	227	56.75	No	161 69 78
07	41	16	12	127	196	49.00	No	169 62 70
08	13	14	12	155	194	48.50	No	234 59 67
09	13	14	12	193	232	58.00	No	96 61 72
10	27	14	10	186	237	59.25	No	81 2 157

Date: August 26, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
22	17	30	15	143	205	51.25	No	279 107 55
23	15	28	14	171	228	57.00	No	246 56 55
24	14	25	12	171	222	55.50	No	278 114 59

Date: August 27, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	13	23	11	156	203	50.75	No	143 69 74
02	12	24	10	151	197	49.25	No	198 66 70
03	11	26	10	139	186	46.50	No	124 65 75
04	19	68	9	132	228	57.00	No	218 66 58
05	48	71	8	116	243	60.75	No	264 76 61
06	48	67	9	109	233	58.25	No	131 66 74
07	47	23	9	127	206	51.50	No	206 56 52
08	17	14	11	155	197	49.25	No	202 30 47
09	15	13	9	193	230	57.50	No	104 50 55
10	7	13	7	186	213	54.25	No	106 357 353

Date: October 6, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	203	307	152	75	737	184.25	No	92 78 67
02	203	307	102	92	709	177.25	No	65 103 102
03	202	307	107	100	716	179.00	No	95 97 84
04	203	286	105	95	689	172.25	No	79 82 91
05	205	250	105	86	646	161.50	No	69 89 93
06	204	250	94	88	636	159.00	No	80 99 91
07	198	268	78	95	639	159.75	No	69 100 107
08	196	294	80	102	672	168.00	No	107 75 67
09	195	278	71	94	638	159.50	No	109 59 61
10	195	263	71	89	618	154.50	No	84 94 128

Date: October 7, 1994

United Monitors

Hour	128710	58710	308810	298810	PPM		Data Missing	Penelec	Conewango	Wind Direction
					Total	Average		58M	125	150
04	217	230	130	78	479	119.75	No	226	89	144
05	215	225	123	99	662	165.50	No	264	75	115
06	212	241	117	99	669	167.25	No	235	57	114
07	204	264	109	95	672	168.00	No	142	65	206

Date: October 8, 1994

United Monitors

Hour	128710	58710	308810	298810	PPM		Data Missing	Penelec	Conewango	Wind Direction
					Total	Average		58M	125	150
01	300	0M18	307	34	641	213.67	Yes	188	84	144
02	300	0M18	303	27	634	211.33	Yes	215	62	89
03	300	0M18	260	24	627	209.00	Yes	275	62	82
04	300	0M18	260	21	581	193.67	Yes	266	61	83
05	300	0M18	265	20	580	193.33	Yes	265	58	43
06	300	0M18	307	18	583	194.33	Yes	96	91	66
07	300	0M18	307	18	625	208.33	Yes	200	81	60
08	300	0M18	307	17	624	208.00	Yes	4	64	52
09	300	0M18	307	16	623	207.67	Yes	116	54	53
10	300	0M18	307	16	623	207.67	Yes	271	59	33
11	300	0M18	307	14	621	207.00	Yes	264	318	331

Date: October 25, 1994

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
04	103	114	0M13	5	222	74.00	Yes	MD 163 62
05	84	102	0M13	5	191	63.67	Yes	MD 112 86
06	57	67	0M13	5	129	43.00	Yes	MD 77 55
07	47	55	0M13	5	107	35.67	Yes	MD 83 73
08	74	92	0M13	5	171	57.00	Yes	MD 83 58
09	126	161	0M13	4	291	97.00	Yes	MD 67 61
10	193	230	0M13	4	427	142.33	Yes	100 54 68
11	224	257	0M13	5	486	162.00	Yes	128 25 27
12	168	246	0M13	5	419	139.67	Yes	105 87 87
13	91	221	0M13	6	318	106.00	Yes	97 97 96
14	89	215	0M13	7	311	103.67	Yes	258 263 254
21	89	76	69	7	241	60.25	Yes	114 99 91
22	106	104	69	7	286	71.50	Yes	107 69 76
23	154	165	116	6	441	110.25	Yes	113 71 78
24	140	217	130	6	493	123.25	Yes	MD 68 78

Date: October 26, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	119	236	0M13	6	361	120.33	Yes	116 66 77
02	95	213	0M13	5	313	104.33	Yes	104 67 96
03	119	214	0M13	5	338	112.67	Yes	135 71 101
04	147	191	0M13	5	343	114.33	Yes	90 76 101
05	157	230	0M13	5	392	130.67	Yes	99 77 102

Date: October 26, 1993 (cont.)

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
06	161	248	0M13	5	414	138.00	Yes	79 86 110
07	167	267	0M13	5	439	146.33	Yes	62 114 137

Date: November 9, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
22	67	168	68	119	422	105.50	No	280 102 78
23	77	167	69	127	440	110.00	No	152 87 79
24	86	165	70	120	441	110.25	No	248 68 64

Date: November 10, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	93	163	71	113	440	110.00	No	244 75 54
02	102	158	68	112	440	110.00	No	217 84 61
03	113	160	75	128	476	119.00	No	263 80 57
04	108	160	89	149	408	102.00	No	255 97 48
05	103	162	85	170	520	130.00	No	138 70 65
06	102	152	78	180	512	128.00	No	137 76 70
07	104	156	71	179	510	127.50	No	151 65 72
08	102	160	71	177	510	127.50	No	172 69 78
09	95	174	71	173	513	128.25	No	113 66 73
10	89	163	65	184	501	125.25	No	109 53 73
11	81	145	59	200	485	121.25	No	248 309 260

Date: November 22, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
23	85	83	38	93	229	74.75	No	130 62 63
24	82	82	37	93	295	73.75	No	156 60 67

Date: November 23, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	83	81	37	100	301	75.25	No	146 59 64
02	83	82	37	102	304	76.00	No	148 64 80
03	85	80	36	99	300	75.00	No	179 65 66
04	87	77	42	91	297	74.25	No	111 67 78
05	98	87	68	87	340	85.00	No	128 71 83
06	100	94	69	88	351	87.75	No	168 70 69
07	95	94	62	94	345	86.25	No	199 64 75
08	83	79	34	99	295	73.75	No	78 79 87
09	80	73	34	111	298	74.50	No	254 40 70
10	82	89	43	113	327	81.75	No	91 72 73
11	83	93	42	110	328	82.00	No	87 65 82
12	85	97	43	92	317	79.25	No	97 148 161

Date: December 27, 1993

United Monitors

Hour	128710	58710	308810	298810	PPM Total	PPM Average	Data Missing	Penelec Conewango Wind Direction 58M 125 150
01	58	48	31	19	156	39.00	No	206 84 89
02	58	50	32	25	165	41.25	No	180 80 75

Date: December 27, 1993

United Monitors

Hour					PPM	PPM	Data
	128710	58710	308810	298810	Total	Average	Missing
03	58	49	32	32	171	42.75	No
04	56	47	30	40	173	43.25	No
05	55	44	29	45	173	43.25	No
06	56	43	42	52	193	48.25	No
07	56	42	58	67	223	55.75	No
08	57	42	57	71	227	56.75	No
09	59	43	43	71	216	54.00	No
10	59	44	27	61	191	47.75	No

Penelec	Conewango	Wind Direction
58M	125	150
245	79	63
256	81	62
117	67	80
153	75	74
194	71	77
124	76	101
107	79	147
240	315	289

Date: January 20, 1994

United Monitors

Hour					PPM	PPM	Data
	128710	58710	308810	298810	Total	Average	Missing
8	016M	183	27	14	224	74.67	Yes
9	016	184	24	13	221	73.67	Yes
10	54	187	23	12	276	69.00	No

Penelec	Conewango	Wind Direction
58M	125	150
69	76	79
177	52	55
115	69	32

Date: February 18, 1994

United Monitors

Hour					PPM	PPM	Data
	128710	58710	308810	298810	Total	Average	Missing
01	220	306	17	200	745	186.25	No
02	221	307	17	189	734	183.50	No
03	219	306	16	151	692	173.00	No
04	217	278	54	149	698	174.50	No
05	210	251	58	146	665	166.25	No

Penelec	Conewango	Wind Direction
58M	125	150
184	76	34
249	76	34
227	63	61
184	61	78
153	58	71

Date: February 18, 1994 (cont.)

United Monitors

Hour					PPM	PPM	Data	Penelec	Conewango	Wind	Direction
	128710	58710	308810	298810	Total	Average	Missing	58M	125	150	
06	210	252	57	142	661	165.25	No	171	58	62	
07	212	281	19	133	645	161.25	No	123	60	83	
08	214	307	15	137	673	168.25	No	159	54	75	

APPENDIX B

March 1993

PENELEC

Date	Hour	Monitor	Conc.	Code
3	4	2	176	P2
3	5	3	118	
3	5	2	225	P2
3	7	2	168	
3	8	2	278	P2
3	9	2	165	
3	10	2	176	
3	11	2	280	P2
7	5	5	466	
7	9	5	484	
12	10	4	220	P2
13	9	4	178	
13	11	4	181	
13	12	4	236	
15	8	5	466	
25	17	3	128	
26	11	2	267	P2
26	15	3	178	
26	22	2	257	P2
26	22	4	207	P2
26	23	2	168	
26	24	2	249	P2
27	1	2	168	
27	10	2	406	P2
27	11	3	131	
27	12	2	207	P2
27	22	4	207	P2

URC CEMS

128710	0058710	0308810	0298810	Total
5	0*16	23	6	MD
38	0*16	24	6	MD
38	0*16	24	6	MD
47	44	71	5	167
14	17	94	6	131
5	16	122	8	151
4	14	54	8	78
2	11	41	8	62
42	43	66	127	278
5	43	14	307	369
8	0*16	19	0*16	MD
7	0*16	18	0*16	MD
8	0*16	18	0*16	MD
7	0*16	17	0*16	MD
74	0*16	24	22	MD
0	0*16	3	0	MD
1	0*16	3	4	MD
0	30	1	0	31
0	0	0	0	0
0	5	0	0	5
0	5	1	0	6
0	5	2	0	7
0	7	4	0	11
0	5	4	2	9
0	7	2	1	10
0	6	1	0	7
0	5	0	0	5

PENELEC

Date	Hour	Monitor	Conc.	Code
27	22	2	165	
27	23	4	241	P2
28	1	2	241	P2
28	1	3	170	P1
28	6	2	173	
29	13	3	170	
29	14	3	110	
29	21	3	115	
30	8	3	123	
30	9	3	202	
30	11	3	194	

URC CEMS

128710	0058710	0308810	0298810	Total
0	0	0	0	0
0	0	0	0	0
0	0	0	3	3
0	0	0	3	3
42	21	44	1	108
0	2	0	61	63
0	2	0	31	33
0	0	0	50	50
10	23	41	19	93
4	19	25	52	100
1	19	24	115	159

PENELEC

Date	Hour	Monitor	Conc.	Code
6	6	1	440	
6	6	5	459	
6	9	4	183	P1
7	3	6	524	
7	4	4	197	
7	4	5	396	
7	4	6	464	
7	5	2	231	P2
7	5	5	372	
7	5	6	417	
7	6	5	474	
7	7	1	511	P1
7	23	4	186	
7	24	4	194	
7	24	2	186	
8	1	6	377	
8	2	5	440	
8	4	2	170	
8	4	5	372	
8	8	6	684	
13	10	3	131	
14	4	3	128	P1
14	5	4	178	
14	6	2	170	
14	9	4	265	P2
14	10	4	189	
16	21	3	123	

URC CEMS

128710	0058710	0308810	0298810	Total
42	35	58	126	261
42	35	58	126	261
4	0	4	97	105
0	92	8	1	101
20	18	9	0	27
0	18	9	0	27
0	18	9	0	27
36	64	46	0	146
36	64	46	0	146
36	64	46	0	146
45	130	61	0	236
50	188	62	0	200
0	0	1	112	113
0	0	2	105	107
0	0	2	105	107
0	0	5	94	99
0	0	5	88	93
0	0	6	120	126
0	0	6	120	126
25	0	29	78	132
5	0	18	13	36
51	10	17	18	96
51	11	59	41	162
48	12	60	84	204
11	11	6	25	53
10	11	5	23	49
4	263	0	24	291

April 1993 (cont.)

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
24	2	5	681	
24	2	6	385	
24	3	4	181	
24	3	6	637	
28	4	6	427	
28	5	6	398	
28	6	6	396	
28	7	6	485	
28	8	4	194	
28	9	2	189	
28	9	3	152	
28	9	4	368	
28	10	2	183	
28	24	5	375	
29	1	4	207	P2
29	1	7	448	
29	2	6	409	
29	2	5	527	
29	2	1	469	
29	4	6	728	P1
29	5	6	925	
29	5	4	265	P2
29	5	2	225	P2
29	5	5	404	
29	6	4	194	
29	6	6	417	
29	6	3	128	

128710	0058710	0308810	0298810	Total
9	8	24	53	94
9	8	24	53	94
17	6	25	54	102
17	6	25	54	102
50	11	13	9	83
51	10	11	15	87
42	9	56	32	139
6	40	95	34	175
35	69	121	30	255
148	127	86	12	373
148	127	86	12	373
148	127	86	12	373
174	150	77	8	409
128	115	57	20	320
27	14	27	20	88
27	14	27	20	88
50	22	22	14	108
50	22	22	14	108
50	22	22	14	181
105	31	15	30	162
63	15	32	52	162
63	15	32	52	162
63	15	32	52	162
48	11	67	74	200
48	11	67	74	200
48	11	67	74	200

April 1993 (cont.)

PENELEC

Date	Hour	Monitor	Conc.	Code
29	6	2	270	P2
29	7	5	469	
29	7	4	372	P2
29	7	2	269	P2
29	7	3	134	
29	7	6	592	
29	8	7	453	
29	8	3	160	
29	8	2	236	P2
29	9	5	367	
29	9	4	183	
29	9	5	563	
29	9	3	134	
29	10	6	545	
29	10	4	218	
29	10	3	123	
29	11	3	113	

URC CEMS

128710	0058710	0308810	0298810	Total
48	11	67	74	200
13	22	67	76	178
13	22	67	76	178
13	22	67	76	178
13	22	67	76	178
13	22	50	103	188
13	22	50	103	188
13	22	50	103	188
21	25	20	97	163
21	25	20	97	163
21	25	20	97	163
21	25	20	97	163
52	26	28	93	199
52	26	28	93	199
52	26	28	93	199
51	23	41	44	159

May 1993

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
1	2	6	469	
1	3	6	383	
1	3	4	194	
1	4	3	186	.
1	5	3	176	
1	6	3	134	
1	9	3	121	
2	7	6	375	
7	19	3	113	
8	7	6	396	
8	9	4	189	
9	4	1	506	P1
9	5	1	608	
9	5	5	590	
9	5	7	545	
9	6	1	540	
10	4	2	220	P2
10	9	4	183	
10	9	2	668	P2
10	10	3	170	P1
10	11	2	183	
10	12	3	304	
10	13	3	123	
10	14	3	128	P1
10	22	3	136	
11	4	5	977	
11	6	5	398	

128710	0058710	0308810	0298810	Total
12	12	11	28	63
16	15	14	79	124
16	15	14	79	124
49	15	15	80	159
47	13	33	66	159
43	11	68	16	138
8	9	34	21	72
6	4	61	38	109
13	0	48	24	85
5	4	6	104	119
3	2	8	28	41
41	0	66	25	132
42	1	52	55	150
42	1	52	55	150
42	1	52	55	150
39	1	7	108	155
42	1	60	28	131
35	13	34	30	112
35	13	34	30	112
25	13	74	25	137
30	17	107	20	174
125	102	133	19	379
226	194	133	20	573
241	207	93	21	562
120	96	0	51	267
59	7	56	34	156
16	0	56	105	177

May 1993 (cont.)

PENELEC

Date	Hour	Monitor	Conc.	Code
11	6	1	713	
12	7	7	398	
17	9	1	484	
18	16	3	118	
21	4	7	535	P1
21	7	1	422	
22	5	1	490	P1
23	7	6	427	
27	11	3	115	
28	4	7	406	
28	5	7	485	
28	5	1	503	
30	5	4	197	
30	6	4	199	

URC CEMS

128710	0058710	0308810	0298810	Total
16	0	56	105	177
2	0	2	106	110
22	10	2	60	94
4	4	23	109	140
8	44	56	91	199
47	20	4	94	165
24	47	56	85	212
47	18	2	120	187
3	2	0	62	67
41	94	54	73	262
48	28	55	109	240
48	28	55	109	240
44	17	60	103	224
44	38	23	104	209

June 1993

PENELEC

Date	Hour	Monitor	Conc.	Code
2	3	5	456	
2	9	5	369	
4	8	6	836	
4	23	5	639	P1
4	23	6	508	P1
4	24	6	500	P1
7	3	5	398	
7	3	7	443	
7	4	1	464	
7	5	1	406	
12	6	1	535	
12	7	1	453	
13	6	2	204	P2
13	6	2	312	P2
13	8	2	207	P2
14	4	6	448	
14	22	7	385	
17	5	1	443	
17	10	7	380	
17	24	1	561	P1
18	3	7	844	
18	3	5	383	
18	3	6	411	
18	4	6	390	
18	4	5	506	
18	4	7	655	
18	4	1	1300	

URC CEMS

128710	0058710	0308810	0298810	Total
4	1	37	49	91
5	17	2	40	64
10	17	57	86	170
11	7	40	48	106
11	7	40	48	106
9	7	30	44	90
1	0	41	44	86
1	0	41	44	86
36	0	59	43	138
42	22	59	70	193
44	32	39	11	126
9	33	1	10	53
43	29	40	12	124
43	29	40	12	124
3	16	0	11	30
37	1	56	77	171
6	7	6	9	28
40	34	42	75	191
0	0	0	0	0
0	0	78	0	78
9	1	37	0	47
9	1	37	0	47
9	1	37	0	47
40	1	32	0	73
40	1	32	0	73
40	1	32	0	73
40	1	32	0	73

JUNE 1995 (CONT.)

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
18	5	1	807	
18	5	7	886	
18	6	6	432	
18	6	2	1135	P1
18	6	7	731	P1
18	7	6	390	
18	7	1	440	
18	7	7	713	P1
18	8	1	493	
18	8	7	566	P1
18	8	6	393	
18	9	6	474	
24	1	5	443	
24	1	1	524	P1
25	7	7	396	

128710	0058710	0308810	0298810	Total
40	28	30	0	98
40	28	30	0	98
31	27	41	0	99
31	27	41	0	99
31	27	41	0	99
0	29	49	35	113
0	29	49	35	113
0	29	49	35	113
11	8	45	84	148
11	8	45	84	148
11	8	45	84	148
16	80	31	149	276
0	0	1	19	20
0	0	1	19	20
0	37	10	228	275

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
4	10	1	563	
4	24	7	466	
5	4	7	448	
5	11	7	443	
5	12	7	375	
9	6	7	493	
9	8	7	393	
14	6	4	183	
14	8	7	380	
14	9	7	414	
18	4	1	414	
18	5	1	432	
19	9	1	404	
23	8	6	375	
24	4	5	448	
24	5	7	445	
24	5	1	472	
24	6	7	424	
24	6	1	409	
24	9	5	417	
24	10	2	194	
24	24	1	424	
24	24	5	404	
25	1	5	540	
25	1	1	490	
25	1	7	385	
25	2	4	278	P2

128710	0058710	0308810	0298810	Total
0	0*18	0*18	0*18	MD
0	0*18	0*18	0*18	MD
41	0*18	0*18	0*18	MD
0	0*18	0*18	0*18	MD
5	0*18	0*18	0*18	MD
45	74	45	0*18	MD
5	17	0	0*18	MD
13	41	0	136	190
32	1	0	133	166
32	1	0	162	195
42	56	56	107	261
41	57	49	98	245
16	6	2	174	198
3	14	14	57	88
33	0*18	0*18	0*18	MD
41	0*18	0*18	0*18	MD
41	0*18	0*18	0*18	MD
42	0*18	0*18	0*18	MD
42	0*18	0*18	0*18	MD
3	0*18	0*18	0*18	MD
2	0*18	0*18	0*18	MD
2	0*18	0*18	0*18	MD
2	0*18	0*18	0*18	MD
3	0*18	0*18	0*18	MD
3	0*18	0*18	0*18	MD
3	0*18	0*18	0*18	MD
3	0*18	0*18	0*18	MD

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
25	3	5	377	
25	5	1	427	
25	5	5	432	
28	7	1	734	
28	7	7	928	

128710	0058710	0308810	0298810	Total
3	0*18	0*18	0*18	MD
42	0*18	0*18	0*18	MD
42	0*18	0*18	0*18	MD
10	55	2	77	144
10	55	2	77	144

August 1993

PENELEC

Date	Hour	Monitor	Conc.	Code
1	7	7	5	
2	23	5	419	
9	8	2	204	P2
10	1	7	561	
10	1	1	574	
10	2	1	595	
10	2	7	611	
12	10	7	757	
14	1	4	380	
14	8	4	241	
15	2	1	406	
15	4	1	590	P1
15	4	5	493	
15	7	5	422	
20	3	1	411	
23	6	6	456	
23	6	2	165	
23	7	2	165	
23	7	1	411	
23	10	7	637	
23	11	1	401	
23	11	7	448	
25	24	1	422	
26	1	1	401	
26	1	7	540	P1
26	7	4	254	P2
26	7	2	181	

URC CEMS

128710	0058710	0308810	0298810	Total
16	59	4	92	171
2	3	3	95	103
4	0*18	7	82	MD
109	39	11	66	225
109	39	11	66	225
45	13	9	70	137
45	13	9	70	137
8	9	9	47	73
6	16	11	1	34
9	20	10	0	39
48	26	11	4	89
48	30	11	0	89
48	30	11	0	89
8	51	11	0	70
31	28	9	137	205
49	59	10	109	227
49	59	10	109	227
49	16	12	127	204
49	16	12	127	204
27	14	10	186	237
27	13	8	142	190
27	13	8	142	190
8	24	10	29	71
8	24	10	43	85
8	24	10	43	85
55	28	7	26	116
55	28	7	26	116

August 1993 (cont.)

PENELEC

Date	Hour	Monitor	Conc.	Code
27	2	1	448	
27	3	1	404	
27	3	7	406	
27	4	1	519	P1
27	4	7	375	
29	4	4	396	
29	4	2	351	
30	7	7	466	
31	7	7	406	

URC CEMS

128710	0058710	0308810	0298810	Total
12	24	10	36	82
11	26	10	41	88
11	26	10	41	88
19	68	9	44	130
19	68	9	44	130
223	60	4	98	385
223	60	4	98	385
5	23	6	66	100
7	14	8	38	67

September 1993

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
5	3	1	566	P1
5	3	7	385	
6	7	7	487	
8	10	2	233	
8	12	6	514	
14	5	1	422	
16	9	4	225	
24	10	3	126	

128710	0058710	0308810	0298810	Total
8	9	9	59	85
8	9	9	59	85
48	0*18	0*18	72	MD
3	12	8	26	49
6	10	12	14	42
29	47	25	268	369
128	124	19	302	573
201	79	0	0	280

October 1993

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
6	1	7	372	
6	6	5	369	
6	7	5	590	P1
6	7	1	511	
6	7	6	427	
6	8	6	432	
6	8	1	464	
6	9	1	786	
6	9	5	574	
6	9	6	1027	
6	9	7	726	
6	10	4	244	P2
6	10	6	401	
6	10	7	372	
6	11	4	194	
6	12	7	404	
6	24	7	375	
7	4	5	511	
7	4	6	836	P1
7	5	6	867	P1
7	5	5	435	
7	5	7	409	
7	6	6	650	P1
7	6	1	535	P1
7	7	4	398	P1
7	7	6	461	
7	8	4	207	

128710	0058710	0308810	0298810	Total
203	307	152	75	737
204	250	94	88	636
198	268	78	95	639
198	268	78	95	639
198	268	78	95	639
196	294	80	102	672
196	294	80	102	672
195	278	71	94	638
195	278	71	94	638
195	278	71	94	638
195	278	71	94	638
195	263	71	89	618
195	263	71	89	618
195	263	71	89	618
197	258	59	80	594
198	244	51	69	562
206	243	94	60	603
217	230	130	98	675
217	230	130	98	675
215	225	123	99	662
215	225	123	99	662
215	225	123	99	662
212	241	117	99	669
212	241	117	99	669
204	264	109	95	672
204	264	109	95	672
203	295	109	93	700

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
7	22	6	710	
7	23	6	686	
7	23	7	404	
7	24	6	684	
8	1	5	757	P1
8	1	6	2955	
8	2	5	469	
8	2	6	1779	P1
8	3	7	383	
8	3	1	411	
8	3	3	139	
8	3	5	865	P1
8	3	6	3231	P1
8	4	1	508	P1
8	4	3	136	
8	4	5	747	P1
8	4	6	2906	
8	5	2	173	
8	5	5	511	
8	5	6	3128	P1
8	6	2	584	
8	6	3	134	
8	6	5	781	
8	6	6	2518	
8	7	2	519	P2
8	7	5	1200	
8	7	6	2219	

128710	0058710	0308810	0298810	Total
300	0*18	307	47	MD
300	0*18	307	46	MD
300	0*18	307	46	MD
300	0*18	307	41	MD
300	0*18	307	34	MD
300	0*18	307	34	MD
300	0*18	307	27	MD
300	0*18	307	27	MD
300	0*18	303	24	MD
300	0*18	303	24	MD
300	0*18	303	24	MD
300	0*18	303	24	MD
300	0*18	303	24	MD
300	0*18	260	21	MD
300	0*18	260	21	MD
300	0*18	260	21	MD
300	0*18	260	21	MD
300	0*18	260	20	MD
300	0*18	260	20	MD
300	0*18	260	20	MD
300	0*18	265	18	MD
300	0*18	265	18	MD
300	0*18	265	18	MD
300	0*18	265	18	MD
300	0*18	307	18	MD
300	0*18	307	18	MD
300	0*18	307	18	MD

October 1993 (cont.)

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
8	8	1	980	
8	8	2	225	P2
8	8	3	186	P1
8	8	5	1370	
8	8	6	2038	
8	8	7	503	
8	9	3	126	
8	9	1	558	
8	9	5	1072	
8	9	6	1163	
8	9	7	485	
8	10	4	553	
8	10	3	181	
8	10	5	702	
8	10	6	977	
8	11	3	123	
8	11	2	257	
8	11	4	778	
8	11	5	791	
8	11	6	1266	
8	12	2	233	
8	12	3	244	
8	12	4	776	
8	12	5	519	
8	12	6	592	
8	24	5	364	
8	24	7	624	

128710	0058710	0308810	0298810	Total
300	0*18	307	17	MD
300	0*18	307	17	MD
300	0*18	307	17	MD
300	0*18	307	17	MD
300	0*18	307	17	MD
300	0*18	307	17	MD
300	0*18	307	17	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	16	MD
300	0*18	307	14	MD
300	0*18	307	14	MD
300	0*18	307	14	MD
300	0*18	307	14	MD
300	0*18	307	14	MD
223	0*18	307	10	MD
223	0*18	307	10	MD
223	0*18	307	10	MD
223	0*18	307	10	MD
81	173	52	124	430
81	173	52	124	430

October 1993 (cont.)

PENELEC

Date	Hour	Monitor	Conc.	Code
11	5	1	474	P1
23	8	6	424	
23	9	6	480	
23	9	1	587	
23	10	1	519	
25	4	5	611	
25	4	6	857	
25	5	6	1349	
25	5	4	393	P2
25	5	5	1064	
25	6	6	757	P1
25	6	5	383	
25	6	2	393	P2
25	6	4	325	
25	7	6	650	
25	7	7	762	
25	7	1	532	
25	7	2	254	P2
25	7	5	173	
25	7	4	616	P2
25	8	5	427	
25	8	6	459	
25	8	6	419	
25	8	2	210	P2
25	8	4	312	P2
25	9	7	466	
25	9	6	383	

URC CEMS

128710	0058710	0308810	0298810	Total
66	95	79	67	307
0	58	0*13	4	MD
0	103	0*13	4	MD
0	103	0*13	4	MD
0	101	0*13	4	MD
103	114	0*13	5	MD
103	114	0*13	5	MD
84	102	0*13	5	MD
84	102	0*13	5	MD
84	102	0*13	5	MD
57	67	0*13	5	MD
57	67	0*13	5	MD
57	67	0*13	5	MD
57	67	0*13	5	MD
47	55	0*13	5	MD
47	55	0*13	5	MD
47	55	0*13	5	MD
47	55	0*13	5	MD
74	92	0*13	5	MD
74	92	0*13	5	MD
74	92	0*13	5	MD
74	92	0*13	5	MD
126	161	0*13	4	MD
126	161	0*13	4	MD

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
25	9	5	134	
25	9	4	314	P2
25	9	5	700	
25	10	3	113	
25	10	6	527	
25	10	2	351	P2
25	10	4	621	P2
25	11	7	849	
25	11	2	207	P2
25	11	5	189	
25	11	4	495	P2
25	12	2	189	
25	12	5	414	
25	12	6	480	
25	12	5	170	
25	12	4	249	
25	13	3	113	
25	14	3	131	
25	21	4	330	P2
25	22	5	152	
25	23	4	286	P2
25	23	3	128	
25	23	6	880	P1
25	23	1	605	P1
25	24	6	1449	P1
25	24	7	671	P1
25	24	2	207	P2

128710	0058710	0308810	0298810	Total
126	161	0*13	4	MD
126	161	0*13	4	MD
126	161	0*13	4	MD
197	230	0*13	4	MD
197	230	0*13	4	MD
197	230	0*13	4	MD
224	257	0*13	5	MD
224	257	0*13	5	MD
224	257	0*13	5	MD
224	257	0*13	5	MD
168	246	0*13	5	MD
168	246	0*13	5	MD
168	246	0*13	5	MD
168	246	0*13	5	MD
168	246	0*13	5	MD
91	221	0*13	6	MD
89	215	0*13	7	MD
89	76	69	7	241
106	104	69	7	286
154	165	116	6	441
154	165	116	6	441
154	165	116	6	441
154	165	116	6	441
140	217	130	6	493
140	217	130	6	493
140	217	130	6	493

OCTOBER 1993 (CONT.)

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
25	24	3	107	
25	24	1	1095	P1
25	24	4	259	P2
25	24	5	618	
26	1	6	4713	P1
26	1	4	642	P2
26	1	5	938	
26	1	1	723	P1
26	1	7	393	P1
26	2	2	584	P2
26	2	4	852	P2
26	2	3	241	P1
26	2	6	1239	P1
26	3	3	262	P1
26	3	2	225	P2
26	3	4	377	P1
26	3	6	773	P1
26	4	2	404	P2
26	4	4	1150	P1
26	4	6	1004	P1
26	5	6	574	P1
26	5	4	946	P1
26	5	3	309	P1
26	5	2	409	P2
26	9	6	925	P1
26	9	5	548	
26	10	4	178	

128710	0058710	0308810	0298810	Total
140	217	130	6	493
140	217	130	6	493
140	217	130	6	493
140	217	130	6	493
119	236	119	6	480
119	236	119	6	480
119	236	119	6	480
119	236	119	6	480
95	213	96	5	409
95	213	96	5	409
95	213	96	5	409
95	213	96	5	409
119	214	141	5	479
119	214	141	5	479
119	214	141	5	479
147	214	141	5	479
147	191	178	5	521
147	191	178	5	521
147	191	178	5	521
157	225	208	5	595
157	225	208	5	595
157	225	208	5	595
157	225	208	5	595
157	237	178	51	623
157	237	178	51	623
157	244	149	0*20	MD

November 1993

PENELEC

Date	Hour	Monitor	Conc.	Code
3	14	6	422	
4	18	7	414	
4	19	7	409	
5	8	1	406	
9	24	1	414	
9	24	5	369	
10	1	7	401	
10	2	7	516	
10	3	5	689	
10	3	7	480	
10	4	5	521	
10	4	4	194	
10	5	5	658	
10	6	1	466	
10	6	5	409	
10	6	7	398	
10	8	7	435	
10	8	5	375	
10	9	5	424	
19	13	1	435	
22	23	5	401	
22	24	7	390	
23	1	4	343	P2
23	1	5	521	
23	12	2	212	
23	13	2	207	
23	14	2	165	

URC CEMS

128710	0058710	0308810	0298810	Total
58	51	21	109	239
59	39	12	208	318
59	36	12	181	288
60	51	10	210	431
186	165	70	120	441
186	165	70	120	441
093	163	71	113	440
102	158	68	112	440
113	160	75	128	476
113	160	75	128	476
108	160	83	149	500
108	160	83	149	500
103	162	85	170	520
102	152	78	180	512
102	152	78	180	512
102	152	78	180	512
102	160	71	177	510
102	160	71	177	510
95	174	71	173	513
65	47	29	109	250
75	83	38	93	289
76	82	37	94	289
76	81	37	100	294
76	81	37	100	294
81	97	43	92	313
75	85	35	70	265
78	87	36	51	252

November 1993 (cont.)

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
23	15	3	131	
23	16	3	136	
23	17	3	131	
23	18	3	107	
23	22	7	380	
23	23	6	411	
23	24	7	372	
24	1	2	197	P2
24	1	4	191	
24	2	2	225	P2
24	3	2	233	P2
24	3	3	136	
24	3	4	176	
24	4	3	128	
24	4	2	273	P2
24	5	2	170	
24	5	5	380	
24	5	3	131	
24	6	3	110	
24	6	5	448	
24	7	5	480	
24	7	2	199	P2
24	7	4	191	
24	8	7	569	
24	9	1	563	
24	9	3	115	
24	12	3	121	
24	12	4	181	

128710	0058710	0308810	0298810	Total
79	87	36	43	245
81	87	37	43	248
75	88	38	53	254
78	90	40	62	270
86	89	42	103	320
85	91	40	102	318
82	87	37	97	303
83	87	38	80	288
83	87	38	80	288
83	83	39	79	284
85	83	40	74	282
85	83	40	74	282
85	83	40	74	282
87	81	46	76	290
87	81	46	76	290
98	95	74	73	340
98	95	74	73	340
98	95	74	73	340
100	101	75	71	347
100	101	75	71	347
95	100	66	74	335
95	100	66	74	335
95	100	66	74	335
83	82	36	85	286
80	70	33	98	281
80	70	33	98	281
85	77	38	103	303
85	77	38	103	303

December 1993

PENELEC

Date	Hour	Monitor	Conc.	Code
2	21	7	490	
2	22	1	466	
9	16	1	438	
9	18	7	490	
9	19	7	545	
9	20	7	430	
9	22	7	482	
10	10	1	427	
10	13	1	427	
10	7	7	380	
13	1	1	409	
13	6	7	440	
13	7	5	409	
13	7	7	380	
13	9	7	398	
13	19	2	257	P2
13	19	4	343	P1
13	20	4	183	
13	22	2	364	P2
13	22	3	160	P1
13	23	2	236	P2
13	23	4	241	P2
13	24	4	495	
13	24	2	204	
14	1	2	173	P2
14	1	4	587	P1
14	1	3	152	

URC CEMS

128710	0058710	0308810	0298810	Total
40	137	33	92	302
43	137	33	90	303
50	66	25	40	181
55	63	24	33	175
53	56	24	41	175
44	50	20	44	158
54	57	24	46	181
59	76	23	82	240
60	63	26	82	231
68	105	68	111	352
71	35	20	0*18	MD
78	66	31	0*18	MD
77	66	59	0*18	MD
77	66	59	0*18	MD
79	37	50	0*18	MD
81	55	7	97	240
81	55	7	97	240
81	54	11	137	283
83	54	27	85	249
83	54	27	85	249
84	54	27	72	237
84	54	27	72	237
87	62	30	64	243
87	62	30	64	243
89	64	30	66	249
89	64	30	66	249
89	64	30	66	249

December 1993 (cont.)

PENELEC

Date	Hour	Monitor	Conc.	Code
14	2	5	424	
14	2	2	270	P2
14	3	2	202	P2
14	4	2	238	P2
14	6	5	364	
14	9	2	186	
14	10	2	168	
14	12	2	199	P2
14	12	4	202	P2
14	15	2	199	P2
14	19	2	293	
14	21	2	181	
14	22	2	183	
15	21	4	194	
24	4	1	427	
27	6	7	508	P1
27	7	7	590	P1
27	8	7	430	
27	9	7	700	P1
27	10	7	606	P2
27	10	1	831	P1
28	21	5	375	
29	1	2	176	
29	6	4	197	
29	6	2	181	P2
29	12	7	422	
29	14	1	417	

URC CEMS

128710	0058710	0308810	0298810	Total
90	65	31	71	257
90	65	31	71	257
86	56	28	82	252
85	52	26	89	252
85	82	37	109	313
92	51	55	75	273
91	51	27	85	254
74	52	26	91	243
74	52	26	91	243
74	57	27	42	200
69	50	25	46	190
69	48	24	71	212
71	48	25	54	198
76	59	27	103	265
80	51	29	216	376
56	43	42	52	193
56	42	58	67	223
57	42	57	71	227
59	43	43	71	216
59	44	27	61	191
59	44	27	61	191
55	55	44	122	276
59	51	39	113	262
66	51	65	241	423
66	51	65	241	423
58	53	33	151	295
56	50	32	25	163

January 1994

PENELEC

Date	Hour	Monitor	Conc.	Code
1	1	3	115	
10	9	5	401	
11	4	1	430	
11	5	1	508	
11	6	1	414	
17	6	7	527	
17	7	7	629	
17	9	1	645	
17	10	1	597	
20	8	6	637	
20	9	6	1803	P1
20	9	5	844	
20	10	6	584	
20	10	5	629	
20	10	4	380	P2
20	10	3	173	
20	10	2	173	
20	11	2	220	
20	11	3	186	P2
20	11	4	314	
23	6	3	113	
23	7	3	128	
23	8	3	126	
23	9	3	118	
23	10	3	113	
25	19	4	183	
25	20	4	191	

URC CEMS

128710	0058710	0308810	0298810	Total
83	92	47	21	243
65	63	32	89	249
36	50	69	37	192
36	49	77	35	197
35	48	77	40	207
53	77	63	293	486
52	79	49	304	484
55	85	29	307	476
52	67	30	307	456
0*16	183	27	307	MD
0*16	185	24	307	MD
0*16	185	24	307	MD
54	187	23	307	571
54	187	23	307	571
54	187	23	307	571
54	187	23	307	571
54	187	23	307	571
117	190	24	307	638
117	190	24	307	638
117	190	24	307	638
194	307	75	32	608
192	307	75	78	652
194	307	56	98	655
192	307	33	97	629
194	307	28	52	581
66	181	60	75	382
66	191	65	54	376

January 1994 (cont.)

PENELEC

Date	Hour	Monitor	Conc.	Code
25	21	4	280	
31	10	1	797	P1
31	10	3	144	
31	10	5	424	
31	10	6	529	P1
31	11	1	679	
31	11	3	228	
31	11	3	202	
31	11	4	325	
31	11	5	844	
31	11	6	692	
31	12	3	202	
31	12	5	571	
31	12	6	571	
31	12	1	419	
31	12	4	178	

URC CEMS

128710	0058710	0308810	0298810	Total
56	198	70	39	363
72	56	26	35	189
72	56	26	35	189
72	56	26	35	189
72	56	26	35	189
64	61	25	90	240
64	61	25	90	240
64	61	25	90	240
64	61	25	90	240
64	61	25	90	240
53	55	24	144	276
53	55	24	144	276
53	55	24	144	276
53	55	24	144	276
53	55	24	144	276

February 1994

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
2	20	7	427	
2	21	7	380	
2	23	1	474	
2	24	1	611	
3	1	1	514	
4	24	3	110	
5	1	3	110	
14	23	1	548	
14	24	4	267	
14	24	6	422	
15	1	3	139	
15	1	4	183	
17	1	1	553	
17	24	4	181	
17	24	6	527	
18	1	3	144	
18	1	4	314	P2
18	1	6	655	P1
18	2	2	197	P2
18	2	3	115	
18	2	5	432	
18	2	6	561	
18	3	3	142	
18	3	6	692	
18	4	2	246	P2
18	4	3	160	
18	4	5	566	

128710	0058710	0308810	0298810	Total
188	102	20	24	334
130	83	20	28	261
215	126	19	56	416
271	251	19	84	625
299	306	20	137	762
192	254	21	203	670
150	252	24	203	629
193	307	16	307	823
193	307	19	307	826
193	307	19	307	826
197	307	22	307	833
197	307	22	307	833
56	78	28	289	451
224	305	17	198	744
224	305	17	198	744
222	306	17	200	745
222	306	17	200	745
222	306	17	200	745
221	307	17	189	702
221	307	17	189	702
221	307	17	189	702
221	307	17	189	702
219	306	16	151	692
219	306	16	151	692
217	278	54	149	698
217	278	54	149	698
217	278	54	149	698

PENELEC

URC CEMS

Date	Hour	Monitor	Conc.	Code
18	4	6	694	
18	5	1	721	P1
18	5	2	322	P2
18	5	3	157	
18	5	5	621	
18	5	6	650	
18	6	1	592	
18	6	2	296	P2
18	6	3	162	
18	6	6	603	
18	6	7	728	
18	6	4	220	P2
18	7	1	613	
18	7	2	343	P2
18	7	4	265	P2
18	7	5	611	
18	7	6	603	
18	7	7	493	
18	8	3	147	
18	8	5	639	P1
18	8	1	404	
18	9	2	278	P2
18	9	3	173	
18	9	4	265	P2
18	9	6	590	
18	10	2	335	P2
18	10	3	197	

128710	0058710	0308810	0298810	Total
217	278	54	149	698
210	251	58	146	665
210	251	58	146	665
210	251	58	146	665
210	251	58	146	665
210	251	58	146	665
210	252	57	142	661
210	252	57	142	661
210	252	57	142	661
210	252	57	142	661
210	252	57	142	661
212	281	19	133	645
212	281	19	133	645
212	281	19	133	645
212	281	19	133	645
212	281	19	133	645
214	307	15	137	673
214	307	15	137	673
214	307	15	137	673
219	295	13	150	677
219	295	13	150	677
219	295	13	150	677
219	295	13	150	677
218	295	11	183	707
218	295	11	183	707

February 1994 (cont.)

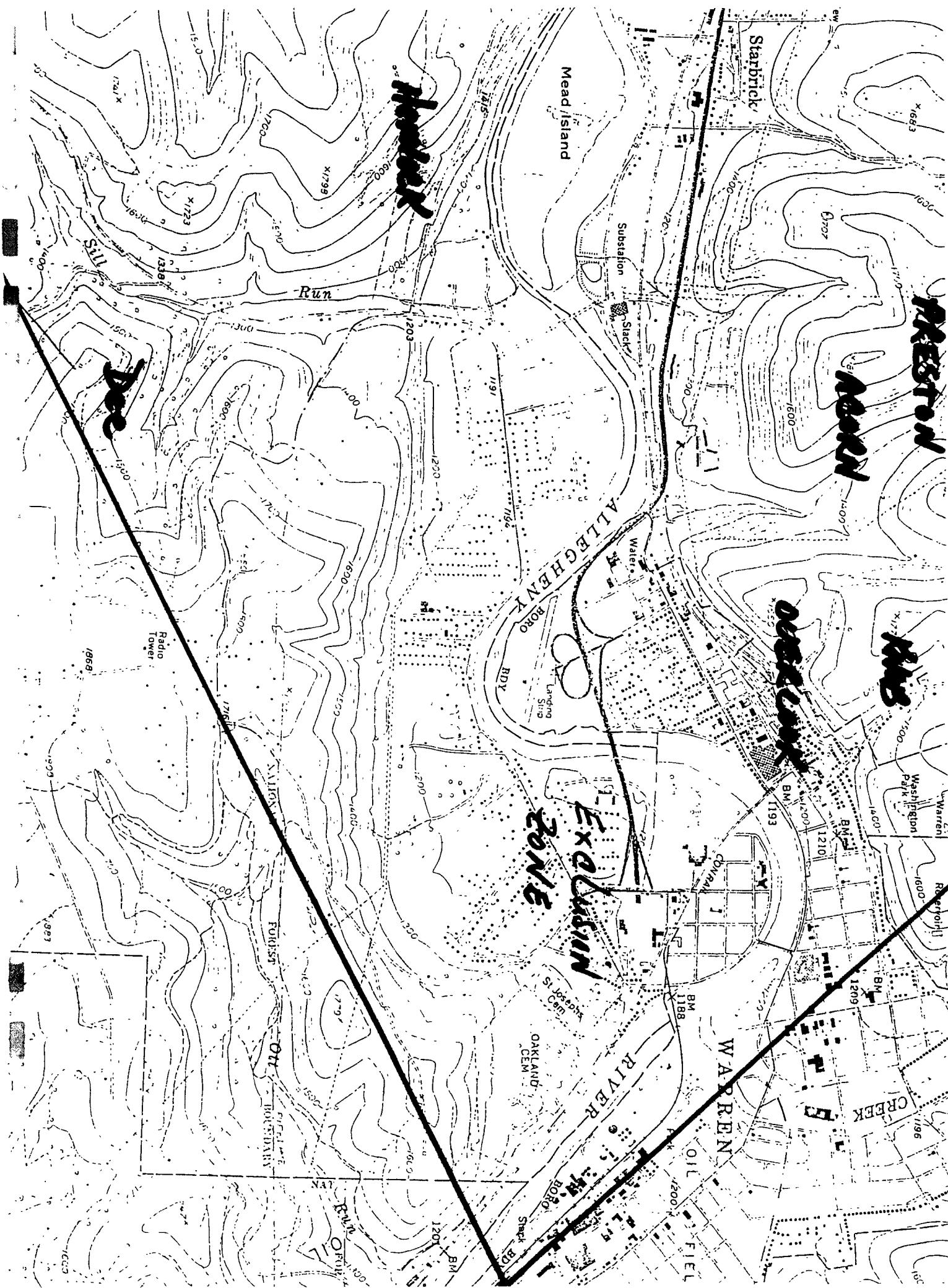
PENELEC

Date	Hour	Monitor	Conc.	Code
18	10	4	312	P2
18	10	7	975	P1
18	10	5	464	
18	10	6	514	
18	11	3	160	
18	11	4	317	
18	11	7	930	P1
18	11	2	204	
18	12	3	186	
18	12	4	259	
18	12	7	563	P2
18	12	2	191	
18	13	2	183	
18	13	3	134	
18	14	3	118	
18	23	5	409	
18	24	5	388	
19	10	3	118	

URC CEMS

128710	0058710	0308810	0298810	Total
218	295	11	183	707
218	295	11	183	707
218	295	11	183	707
218	295	11	183	707
218	292	9	233	752
218	292	9	233	752
218	292	9	233	752
218	292	9	233	752
235	249	8	280	772
235	249	8	280	772
235	249	8	280	772
235	249	8	280	772
266	177	6	298	747
266	177	6	298	747
287	119	5	219	630
16	36	9	15	76
17	35	8	16	76
12	35	8	18	73

APPENDIX C



Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
3/3	4	2	176	87	93	79
3/3	5	2,3	118,225	103	80	66
3/3	7	2	168	95	64	69
3/3	8	2	278	96	81	81
3/3	9	2	165	80	74	75
3/3	10	2	176	93	74	65
3/3	11	2	280	73	75	71
3/7	5	5	466	248	78	225
3/7	9	5	474	249	227	218
3/12	10	4	220	245	270	270
3/13	9	4	178	47	48	42
3/13	11	4	181	46	41	33
3/13	12	4	236	55	45	36
3/15	8	5	466	210	279	226
3/25	17	3	128	330	348	346
3/26	11	2	267	233	352	16
3/26	15	3	178	35	39	29
3/26	22	2,4	257,207	79	87	72
3/26	23	2	168	84	87	89
3/26	24	2	249	91	77	82
3/27	1	2	168	108	72	89
3/27	10	2	406	84	78	73
3/27	11	2	131	84	84	79
3/27	12	2	207	85	90	86
3/27	22	2,4	165,207	89	98	83
3/27	23	4	241	90	80	59

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
3/28	1	2,3	241,170	98	76	61
3/28	6	2	173	95	55	45
3/29	13	3	170	61	5	353
3/29	14	3	110	331	339	335
3/29	21	3	115	277	326	338
3/30	8	3	123	238	266	272
3/30	9	3	202	262	281	290
3/30	11	3	194	2	9	57
4/6	6	1,5	440,459	94	91	102
4/6	9	4	183	94	106	105
4/7	3	6	524	117	62	84
4/7	4	4,5,6	197,396,464	150	60	69
4/7	5	2,5,6	231,372,417	112	62	78
4/7	6	5	474	94	63	72
4/7	7	1	511	110	70	82
4/7	23	4	186	93	73	85
4/7	24	2,4	186,194	109	68	86
4/8	1	6	377	140	53	63
4/8	2	5	440	101	67	84
4/8	4	2,5	170,372	93	84	118
4/8	8	6	684	80	75	91
4/13	10	3	131	256	271	267
4/14	4	3	128	98	75	85
4/14	5	4	178	102	81	87
4/14	6	2	170	95	75	91
4/14	9	4	265	101	66	63

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind Direction		
				58M	125	150
4/16	21	3	123	322	329	323
4/24	2	5,6	681,385	109	62	64
4/24	3	4,6	181,637	112	74	88
4/28	4	6	427	172	62	70
4/28	5	6	398	149	62	79
4/28	6	6	396	166	62	77
4/28	7	6	485	122	67	89
4/28	8	4	194	99	97	132
4/28	9	2,3,4	189,152,368	70	149	160
4/28	10	2	183	132	163	168
4/29	1	4,7	207,448	181	62	84
4/29	2	1,5,6	469,527,409	184	64	75
4/29	4	6	728	176	59	71
4/29	5	2,4,5,6	225,265,404,925	154	61	71
4/29	6	2,3,4,6	270,128,194,417	123	66	77
4/29	7	2,3,4,5,6	269,134,372,469,592	154	60	91
4/29	8	2,3,7	236,160,367	235	58	111
4/29	9	3,4,5	134,183,563	89	60	101
4/29	10	3,4,6	123,218,545	287	295	252
4/29	11	3	113	256	252	247
5/1	2	6	469	257	31	43
5/1	3	4,6	194,383	251	178	131
5/1	4	3	186	293	107	142
5/1	5	3	176	270	286	264
5/1	6	3	134	59	67	26
5/1	9	3	121	157	166	176

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
5/2	7	6	375	97	89	89
5/8	7	6	396	110	65	87
5/8	9	4	189	89	68	75
5/9	4	1	506	200	75	67
5/9	5	1,5,7	608,590,545	250	82	74
5/9	6	1	540	200	72	77
5/10	4	2	220	75	89	66
5/10	9	2,4	668,183	77	79	79
5/10	10	3	170	76	26	16
5/10	11	2	183	203	272	289
5/10	12	3	304	202	212	206
5/10	13	3	123	81	77	64
5/10	14	3	128	220	252	251
5/10	22	3	136	286	299	302
5/11	4	5	977	259	86	76
5/11	6	1,5	713,398	272	272	261
5/12	7	7	398	235	52	53
5/17	9	1	482	287	249	221
5/18	16	3	118	85	72	64
5/21	4	7	535	79	98	102
5/21	7	1	422	123	325	302
5/22	5	1	490	165	60	52
5/23	7	6	427	229	61	84
5/27	11	3	115	259	275	277
5/28	4	7	406	121	149	172
5/28	5	1,7	503,485	240	259	245

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
5/30	5	4	197	151	77	52
5/30	6	4	199	130	90	70
6/2	3	5	456	79	99	86
6/2	9	5	369	278	298	285
6/4	8	6	836	132	67	56
6/4	23	5,6	639,508	92	119	121
6/4	24	6	500	93	115	118
6/7	3	5,7	398,443	155	64	66
6/7	4	1	464	115	72	72
6/7	5	1	406	79	83	85
6/12	6	1	535	355	186	194
6/12	7	1	453	71	122	140
6/13	6	2	204	94	66	70
6/13	8	2	207	86	93	99
6/14	4	6	448	76	93	119
6/14	22	7	385	65	141	145
6/17	5	1	443	252	71	72
6/17	10	7	380	97	71	64
6/17	24	1	561	111	80	66
6/18	3	5,6,7	383,411,844	46	81	61
6/18	4	1,5,6,7	1300,506,390,655	170	64	65
6/18	5	1,7	807,886	189	68	79
6/18	6	2,6,7	1135,432,731	195	64	96
6/18	7	1,6,7	440,390,713	158	71	106
6/18	8	1,6,7	493,393,566	93	350	240
6/18	9	6	474	350	284	266

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
6/24	1	1,5	524,443	93	74	92
6/25	7	7	396	78	143	164
7/4	10	1	563	248	322	305
7/4	24	7	466	230	79	122
7/5	4	7	448	287	28	92
7/5	11	7	443	93	98	94
7/5	12	7	375	123	138	137
7/9	6	7	493	98	86	83
7/9	8	7	393	94	75	72
7/14	6	4	183	205	65	67
7/14	8	7	380	89	81	118
7/14	9	7	414	94	144	162
7/18	4	1	414	145	67	83
7/18	5	1	432	153	71	80
7/19	9	1	404	48	110	187
7/23	8	6	375	290	254	269
7/24	4	5	448	187	79	211
7/24	5	1,7	472,445	151	59	86
7/24	6	1,7	409,424	191	54	84
7/24	9	5	417	96	50	351
7/24	10	2	194	82	83	305
7/24	24	1,5	424,404	119	77	122
7/25	1	1,5,7	490,540,385	205	76	229
7/25	2	4	278	82	65	217
7/25	3	5	377	115	68	81
7/25	5	1,5	427,432	103	69	79

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
7/28	7	1,7	734,928	88	65	MD
8/1	7	7	500	73	92	97
8/2	23	5	419	142	94	140
8/9	8	2	204	78	100	104
8/10	1	1,7	574,561	114	67	67
8/10	2	1	595,611	167	72	68
8/12	10	7	757	256	300	308
8/14	1	4	380	292	288	299
8/14	8	4	241	264	230	174
8/15	2	1	406	169	105	66
8/15	4	1,5	590,493	76	85	95
8/15	7	5	422	77	43	23
8/20	3	1	411	299	196	201
8/23	3	1	411	116	69	72
8/23	6	2,6	165,456	161	69	78
8/23	7	1,2	411,165	169	62	70
8/23	10	7	637	81	2	157
8/23	11	1,7	401,448	289	285	255
8/25	24	1	422	170	78	76
8/26	1	1,7	401,540	139	80	72
8/26	7	2,4	181,254	88	85	81
8/27	2	1	448	198	66	70
8/27	3	1	404,406	124	65	75
8/27	4	1,7	519,375	218	66	58
8/29	10	2,4	351,396	184	180	136
8/30	11	7	466	151	182	191

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
8/31	3	7	406	211	179	175
9/5	3	1,7	566,385	30	85	89
9/6	7	7	487	66	130	165
9/8	10	2	233	197	249	250
9/8	12	6	514	284	283	277
9/14	5	1	422	183	193	190
9/16	9	4	225	38	44	40
9/24	10	3	126	104	98	98
10/6	1	7	372	92	78	67
10/6	6	5	369	80	99	91
10/6	7	1,5,6	511,590,427	69	100	107
10/6	8	1,6	464,432	107	75	67
10/6	9	1,5,6,7	786,574,1027.726	109	59	61
10/6	10	4,6,7	244,401,372	84	94	128
10/6	11	4	194	116	147	149
10/6	12	7	404	182	184	178
10/6	24	7	375	80	149	161
10/7	4	5,6	511,836	226	89	144
10/7	5	5,6,7	435,867,409	264	75	115
10/7	6	1,6	535,650	235	57	114
10/7	7	4,6	398,461	142	65	206
10/7	8	4	207	238	160	189
10/7	22	6	710	194	142	176
10/7	23	6,7	686,404	203	89	161
10/7	24	6	684	124	88	158
10/8	1	5,6	757,2955	188	84	144

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
10/8	2	5,6	469,1779	215	62	89
10/8	3	1,3,5,6,7	411,139,865,3231,383	275	62	82
10/8	4	1,3,5,6	508,136,747,2906	266	61	83
10/8	5	2,5,6	173,511,3128	265	58	43
10/8	6	2,3,5,6	584,134,781,2518	96	91	66
10/8	7	2,5,6	519,1200,2219	200	81	60
10/8	8	1,2,3,5,6,7	980,225,186,1370,2038,503	4	64	52
10/8	9	1,3,5,6,7	558,126,1072,1163,485	116	54	53
10/8	10	3,4,5,6	181,553,702,977	271	59	33
10/8	11	2,3,4,5,6	257,123,778,791,1266	264	318	331
10/8	12	2,3,4,5,6	233,244,776,519,592	282	281	265
10/8	24	5,7	364,624	263	73	134
10/11	5	1	474	84	71	73
10/23	8	6	424	315	294	191
10/23	9	1,6	587,480	320	20	28
10/23	10	1	519	224	283	265
10/25	4	5,6	611,857	MD	163	62
10/25	5	4,5,6	393,1064,1349	MD	112	86
10/25	6	2,4,5,6	393,325,383,757	MD	77	55
10/25	7	1,2,4,5,6,7	532,254,616,173,650,762	MD	83	73
10/25	8	2,4,5,6	210,312,427,459	MD	83	58
10/25	9	4,5,6,7	314,134,383,466	MD	67	61
10/25	10	2,3,4,6	351,113,621,527	100	54	68
10/25	11	2,4,5	207,495,189	128	25	27
10/25	12	2,3,4,5,6	189,170,249,414,480	105	87	87
10/25	13	3	113	97	97	96

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
10/25	14	3	131	258	263	254
10/25	21	4	330	114	99	91
10/25	22	5	152	107	69	76
10/25	23	1,3,4,6	605,128,286,880	113	71	78
10/25	24	1,2,3,4, 5,6,7	605,207,107,259,618,1449,671	MD	68	78
10/26	1	1,4,5,6,7	723,642,938,4713,393	116	66	77
10/26	2	2,3,4,6	584,241,852,1239	104	67	96
10/26	3	2,3,4,6	225,262,377,773	135	71	101
10/26	4	2,4,6	404,1150,1004	90	76	102
10/26	5	3,4,6	309,946,574	99	77	110
10/26	9	5,6	548,925	91	131	135
10/26	10	4	178	130	146	146
11/3	3	6	422	254	253	244
11/4	18	7	414	163	171	169
11/4	19	7	409	145	163	161
11/5	8	1	406	188	193	189
11/9	24	1,5	414,369	248	68	64
11/10	1	7	401	244	75	54
11/10	2	7	516	217	84	61
11/10	3	5,7	689,480	263	80	57
11/10	4	4,5	194,521	255	97	48
11/10	5	5	658	138	70	65
11/10	6	1,5,7	466,409,398	137	76	70
11/10	8	5,7	375,435	172	69	78
11/10	9	5	424	113	66	73
11/19	13	1	435	236	227	218

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind Direction		
				58M	125	150
11/22	23	5	401	130	62	63
11/22	24	7	390	156	60	67
11/23	1	4,5	343,521	146	59	64
11/23	12	2	212	97	148	161
11/23	13	2	207	82	106	122
11/23	14	2	165	135	152	155
11/23	15	3	131	163	168	165
11/23	16	3	136	121	141	141
11/23	17	3	131	103	136	140
11/23	18	3	107	74	142	147
11/23	22	7	380	120	84	133
11/23	23	6	411	257	75	136
11/23	24	7	372	277	68	83
11/24	1	2,4	197,191	84	64	97
11/24	2	2	225	177	61	76
11/24	3	2,3,4	233,136,176	138	61	88
11/24	4	2,3	273,128	181	65	92
11/24	5	2,3,5	170,131,380	191	67	103
11/24	6	3,5	110,448	236	58	68
11/24	7	2,4,5	199,191,480	258	85	69
11/24	8	7	569	278	337	5
11/24	9	1,3	563,115	242	194	179
11/24	12	3,4	121,181	82	62	54
12/2	21	7	490	194	203	199
12/2	22	1	466	245	234	229
12/9	16	1	438	182	183	178

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
12/9	18	7	490	134	158	160
12/9	19	7	545	138	167	168
12/9	20	7	430	141	173	173
12/9	22	7	482	94	132	142
12/10	7	7	380	176	181	178
12/10	10	1	427	184	191	189
12/10	13	1	427	196	204	201
12/13	1	1	409	204	71	72
12/13	6	7	440	218	79	65
12/13	7	5,7	409,380	236	70	66
12/13	9	7	398	97	68	73
12/13	19	2,4	257,343	182	95	94
12/13	20	4	183	221	86	83
12/13	22	2,3	364,160	243	34	53
12/13	23	2,4	236,241	285	270	326
12/13	24	2,4	204,495	177	359	114
12/14	1	2,3,4	173,152,587	115	79	81
12/14	2	2,5	270,424	125	81	87
12/14	3	2	202	215	64	93
12/14	4	2	238	78	89	83
12/14	6	5	364	109	76	82
12/14	9	2	186	91	84	81
12/14	10	2	168	84	96	77
12/14	12	2,4	199,202	93	88	84
12/14	15	2	199	89	57	50
12/14	19	2	293	96	71	23

Year: 1993

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
12/14	21	2	181	116	51	44
12/14	22	2	183	176	54	47
12/15	21	4	194	89	62	41
12/24	4	1	427	117	201	204
12/27	6	7	508	153	75	74
12/27	7	7	590	194	71	77
12/27	8	7	430	124	76	101
12/27	9	7	700	107	79	147
12/27	10	1,7	831,606	240	315	289
12/28	21	5	375	85	71	85
12/29	1	2	176	109	61	82
12/29	6	2,4	181,197	123	99	116
12/29	12	7	422	181	189	186
12/29	14	1	417	188	187	192

Year: 1994

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
1/1	1	3	115	248	234	226
1/10	9	5	401	107	79	92
1/11	4	1	430	166	188	187
1/11	5	1	508	173	198	195
1/11	6	1	414	215	209	204
1/17	6	7	527	161	170	168
1/17	7	7	629	173	183	180
1/17	9	1	645	183	192	189

Year: 1994

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind 58M	Direction 125	150
1/17	10	1	597	167	180	178
1/20	8	6	637	69	76	79
1/20	9	5,6	844,1803	177	52	55
1/20	10	2,3,4,5,6	173,173,380,629,584	115	69	32
1/20	11	2,3,4	220,186,314	198	359	330
1/23	6	3	113	143	189	193
1/23	7	3	128	154	207	206
1/23	8	3	126	155	197	197
1/23	9	3	118	168	202	205
1/23	10	3	113	210	218	214
1/25	19	4	183	34	45	47
1/25	20	4	191	38	48	47
1/25	21	4	280	43	54	51
1/31	10	1,3,5,6	797,144,424,529	221	231	262
1/31	11	1,3,4,5,6	679,228,325,844,692	216	215	267
1/31	12	1,3,4,5,6	419,202,178,571,571	278	293	290
2/2	20	7	427	127	157	158
2/2	21	7	380	159	177	177
2/2	23	1	474	181	186	184
2/2	24	1	611	190	194	191
2/3	1	1	514	197	201	197
2/4	24	3	110	284	290	272
2/5	1	3	110	270	286	291
2/14	23	1	548	65	116	166
2/14	24	4,6	267,422	66	212	216
2/15	1	3,4	139,183	339	250	230

Year: 1994

Date	Hour	Penelec Monitor	Penelec Monitor Concentration	Wind Direction		
				58M	125	150
2/17	1	1	553	91	104	160
2/17	24	4,6	181,527	204	60	84
2/18	1	3,4,6	144,314,655	184	76	68
2/18	2	2,3,5,6	197,115,432,561	249	76	34
2/18	3	3,6	142,692	227	63	61
2/18	4	2,3,5,6	246,160,566,694	184	61	78
2/18	5	1,2,3,5,6	721,322,157,621,650	153	58	71
2/18	6	1,2,3,6,7	582,296,162,603,728	171	58	62
2/18	7	1,2,4,5,6,7	613,343,265,611,603,493	123	60	83
2/18	8	1,3,5	404,147,639	159	54	75
2/18	9	2,3,4,6	278,173,265,590	140	65	81
2/18	10	2,3,4,5,6,7	335,197,312,464,514,975	119	76	125
2/18	11	2,3,4,7	204,160,317,930	99	99	133
2/18	12	2,3,4,7	191,186,259,563	44	167	181
2/18	13	2,3	183,134	214	211	209
2/18	14	3	118	226	221	216
2/18	23	5	409	91	146	159
2/18	24	5	388	111	132	154
2/19	10	3	118	8	258	228

APPENDIX D

Dates/Hours of Possible Impact by United Based on Wind Direction

Date.....Hours	Date.....Hours	Date.....Hours	Date.....Hours
3/3/93 4	4/24/93 2	5/28/93 4	7/18/93 4
5	3	5	5
7		6	
8	4	6/2/93 3	7/19/93 9
9	5		
10	6	6/2/93 3	7/24/93 4
11	7		5
	8	6/4/93 8	6
3/7/93 5	9	23	9
	10	24	10
3/13/93 11			24
	4/29/93 1	6/7/93 3	
3/26/93 11	2	4	7/25/93 1
15	3	5	2
22	4		3
23	5	6/12/93 7	5
	6		
3/27/93 1	7	6/13/93 6	7/28/93 7
10	8	8	
11	9		8/1/93 7
12		6/14/93 4	
22	5/1/93 2	22	8/2/93 23
23	4		
	6	6/17/93 5	8/9/93 8
3/28/93 1		10	
6	5/2/93 7	24	8/10/93 1
			2
3/29/93 13	5/8/93 7	6/18/93 3	
	9	4	8/15/93 2
3/30/93 11	5/9/93 4	5	4
		6	7
4/6/93 6	5	7	
9	6	8	8/23/93 3
			6
4/7/93 3	5/10/93 4	6/24/93 1	7
4	9		10
5	10	6/25/93 7	
6	13		8/25/93 24
7		7/4/93 24	
23	5/11/93 4		8/26/93 1
24		7/5/93 4	7
	5/12/93 7	11	
4/8/93 1		12	8/27/93 2
2	5/18/93 16		3
4		7/9/93 6	4
8	5/21/93 4	8	
	7		9/5/93 3
4/14/93 4		7/14/93 6	
5	5/22/93 5	8	9/6/93 7
6		9	
9	5/23/93 7		9/16/93 9
10			9/24/93 10

Dates/Hours of Possible Impact by URC Based on Wind Direction

Date.....Hours	Date.....Hours	Date.....Hours
10/6/93 1 6 7 8 9 10 11 24	11/9/93 24 11/10/93 1 2 3 4 5 6 8	12/14/93 15 (cont.) 19 21 22 12/15/93 21 12/24/93 4
10/7/93 4 5 6 7 23 24	11/22/93 23 24	12/27/93 6 7 8 9
10/8/93 1 2 3 4 5 6 7 8 9	11/23/93 1 11 12 13 16 17 22 23 24	12/28/93 21 12/29/93 1 6 1/10/94 9 1/20/94 8 9 10
10/11/93 5	11/24/93 1 2 3 4	1/25/94 19 20 21
10/23/93 9	5 6 7 8	2/2/94 20
10/25/93 4 5 6 7 8 9 10 11 12 13 21 22 23 24	12/9/93 20 22	2/14/94 23 2/17/94 1 24
10/26/93 1 2 3 4 5 9 10	12/13/93 1 6 7 9 19 20 22 24	2/18/94 1 2 3 4 5 6 7 8 9 10 11 12 23 24
	12/14/93 1 2 3 4 5 9 10 12	24

Dates/Hours of Possible Impact by URC based on Wind Variability

Date.....Hours	Date.....Hours
3/7/93 9	10/6/93 12
3/12/93 10	10/7/93 8 22
3/15/93 8	10/8/93 11
3/25/93 17	10/23/93 12
3/29/93 14	10/25/93 14
3/30/93 8 9	11/23/93 14 15
4/29/93 10	
5/1/93 3 5 9	11/24/93 9 12/13/93 23
5/10/93 11	12/27/93 10
5/10/93 12 14	12/29/93 12 14
5/11/93 6 7	1/11/94 4 5
5/17/93 9	6
5/28/93 5	1/20/94 11
6/2/93 9	1/31/94 10
6/12/93 6	2/2/94 21
6/18/93 9	2/15/94 1
7/4/93 10	2/18/94 13
8/12/93 10	2/18/94 14
8/14/93 7 8	3 8
8/20/93 3	
8/23/93 11	
8/29/93 10	
8/30/93 11	
9/8/93 10 12	
	3 6

Dates/Hours of Possible Impact by URC based on Minimal Wind Dispersion
< 2.0 mph within the interval

Date.....Hours

7/23/93, 8

8/31/93 3

1/31/94 11
12

2/4/94 24

2/5/94 1

Dates/Hours of No Probable Impact by URC

Date.....Hours

3/29/93 21

TOP 100
list

4/13/93 10

4/16/93 21

We had no
reference to

4/29/93 11

5/10/93 22

9/14/93 5

URC in way
of this

11/3/93 14

11/4/93 18
19

11/5/93 8

11/19/93 13

12/2/93 21
22

12/9/93 16
18
19

12/10/93 7
10
13

1/17/94 6
7
9
10

1/23/94 6
7
8
9
10

2/2/94 23
24

2/3/94 1